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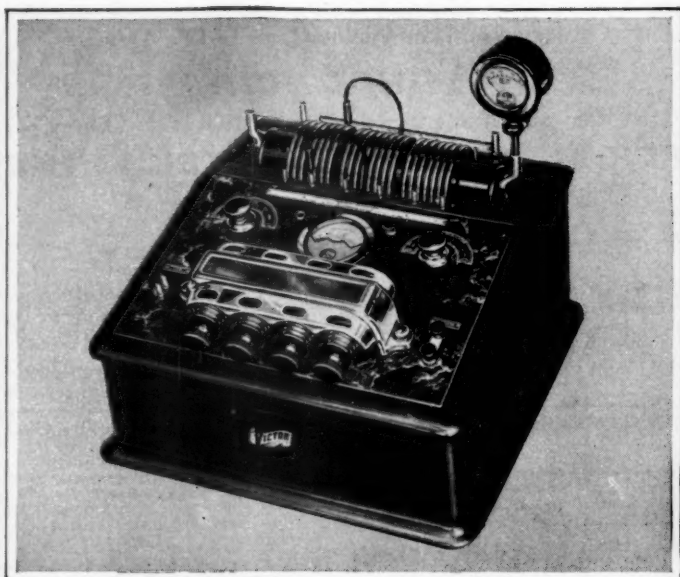
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THE PENETRATION OF ULTRAVIOLET LIGHT THROUGH THE HUMAN SKIN*†

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The problem of the penetration of light through the skin is very complicated. A number of difficulties arise as soon as one enters upon an investigation of this subject. Difficulties even exist as to the proper method of approach. Although much scientific work has been done by able investigators, the results have been so contradictory that only errors in technic could explain the majority of the discrepancies. In order to simplify the problem, several separate experiments were conducted.

It will be recalled that work of a preliminary nature was conducted by A. Bachem and J. Kunz¹, which was reported to this society two years ago. Therein the contemporary literature was reviewed, the photographic and photoelectric methods of observation were carefully described and the following results were obtained:

1. Transmission curves of the skin, some of the various skin layers and constituents of the skin in a highly purified spectrum.

2. The indication that the photographic and the photoelectric methods gave different re-

sults, on account of the different registration of pure absorption, scattering and fluorescence.

3. The proof that the ultraviolet, and even the far ultraviolet parts of the spectrum, penetrate deeper and stronger than observed by Haselbalch and most of the other investigators, except by Macht and his co-workers, who found an even greater penetration than we, with the same method of observation.

4. The proof that the various layers of the skin exert a very different absorption and show characteristic absorption bands.

5. The possibility of a synthetic construction of the skin sensitivity curve toward erythema production by the passive and active absorption in the epidermis.

6. A suggestion as to how deep the various rays penetrate the skin, and which portion of the rays may be useful for practical purposes.

The question of the different behavior of the various skin layers was considered in a second investigation.² Frozen skin sections obtained from the plantar surfaces of fresh bodies were placed over the slit of the quartz spectrograph, with the surface of the skin at a right angle to the slit. The spectrum of the Kromayer lamp through the visible and the whole ultraviolet was obtained on a photographic plate with the widest variation of ex-

*Read at the eighth annual meeting of American Congress of Physical Therapy, Chicago, Nov. 4, 1929.

†This investigation was financed in part by a grant from the Phi Rho Sigma Medical Fraternity, in part by a similar grant from the Committee on Scientific Investigation of the American Medical Association.

posure, with and without the skin sections interposed. Every spectral line showed the transmission of the various skin layers from the *stratum corneum* to the *corium* in closest comparison for the same thickness of every layer, from 10 to 70 μ with various sections on different plates. The absorption coefficients were calculated from these observations for every layer. These were found to vary slightly with the thickness of the section, for which observation an explanation can be found in *reflection* and *scattering*. The absorption curves showed marked differences for the various layers. The *corneum* and the *granulosum* exhibited a maximum absorption of 280 $\mu\mu$ coinciding with the maximum of the antirachitic effect as observed by Sonne. This suggests that the antirachitic effect takes place in one or both of these layers. The *corium* and *stratum germinativum* do not show an increased absorption at this wave length, but exhibit a gradual increase in absorption. The production of an erythema occurs in these layers in the shadow of the upper layers. This explains the decrease in sensitivity as was observed by Hausser and Vahle at 280 $\mu\mu$.

As the results of this investigation were given:

1. The exponential law of absorption does not hold accurately for various thickness of sections, on account of reflection, scattering, and fluorescence.

2. The skin cannot be considered as consisting of layers with identical absorption. The various layers show pronounced absorption differences.

3. A comparison of the absorption curves of the various skin layers suggests that the antirachitic effect is produced in the *stratum corneum* or *granulosum* and that the erythema originates in the *stratum germinativum* or *corium*.

Before proceeding any further we³ took up the question of the behavior of live and dead tissue toward the penetration of light. This problem was taken up several times, but reopened by a publication of Macht, Anderson, Bell.⁴

In this investigation we determined the transmission for the whole photographic spectrum through skin specimens of dogs and rabbits. The same specimen was observed while alive and after death. In the case of the dead tissue we either kept the skin moist with Ringer solution or allowed it to dry out. We arrived at the following conclusions:

1. It could be shown by an extremely simple and conclusive method that little difference of transmission exists between live and dead tissue, for a few hours after death, if kept wet in Ringer solution and well stretched. Therefore, with proper precautions, dead tissue can be used for the study of light transmission through animal skin.

2. The pronounced difference of transmission through dried and wet skin permitted the estimation of the relative importance of true absorption and scattering. The true absorption coefficient was found to change slowly with the wavelength, the scattering coefficient was found to be nearly constant.

These positive results encouraged us to continue our research with (properly treated) dead skin specimens, and to investigate by physically correct means the two kinds of absorption, namely, true absorption and scattering in the skin.

A preliminary work on this problem was done by Stenstroem and Reinhard.⁵

Observing mouse and human skin by means of spectrograph and of filters with the skin specimen close to and far away from the photographic plate, they could estimate that the amount of light scattered through $\frac{1}{2}$ mm. thick skin of young mice is about 100 times as great as the amount going straight through it.

In our work we used filters which selected small parts out of the mercury spectrum. We tried a large number of Wratten filters and then combined some of them in order to narrow the transmitted band. The exact transmission was determined spectrophotographically (with proper consideration of the Schwartzschild factor). The following chart gives the results of these ob-

servations and indicates the spectral area transmitted by the various filters.

CHART 1.

FILTERS, PERCENTAGE TRANSMISSION						
λ $\mu\mu$	16 No. 2	75	36 No. 2	18a No. 2	Uviol	18a 12
578	60	0				
546	60	1				
491	0	18	0			
435		0	25			
405			15	0		
391			3	6	0	
388			0	5	18	
365				0	40	
353				0	45	
343					26	0
334					14	2
313					0	2
302						0

A few preliminary tests were made with a piece of silk paper for trying out the method and collecting some technical experience. After this we used four skin specimens: A piece of skin from the inner part of a rabbit ear, .060 mm. thick, dried out, left over from the previous experiment on live and dead tissue; a piece of skin from a new born infant, autopsy, cut down to .36 mm. thickness with the microtome, kept moist with Ringer solution; a piece of skin, peeled off from a case of callosity, kept dry, .30 mm. thick; and a piece of epidermis removed from the arm of a patient by use of a cantharides plaster, .067 mm. thick, kept moist with Ringer solution.

The transmission of each of these specimens was tried under three conditions:

(a) The skin was brought in immediate contact with the photographic plate, by use of a specially constructed plate holder with a large hole; the skin was placed on the opening of a short rubber tube, and this was slid into the hole of the plateholder to closest contact. The filters were put immediately in front of the skin. A shutter allowed to expose from 1 second to any time up to 2000 seconds.

(b) The skin was placed on the slit of the spectrograph in immediate contact with the

metal parts and the usual spectrographic observations made.

(c) The skin was placed half way between the light source and the photographic plate; the light was conducted through blackened stove pipes. A series of diaphragms prevented any light from going from the light source to the plate except on a straight line. The total distance amounted to approximately 12 feet.

With these arrangements we were able to determine:

(a) The light transmitted, including all the scattered light. This case comes very close to the actual conditions in irradiation of the skin. All the scattered light is registered, even a back scattering might occur due to the photographic layer, as it may happen within the skin. With this method one can determine the coefficient of true absorption.

(c) The transmitted light, with all the scattered light excluded. This case is of no immediate comparison with any actual treatment conditions. From the resulting figures one can determine the total absorption coefficient. The total absorption was so pronounced, that only a few experiments could be made with the least absorbing filters and the more penetrating rays.

(b) The spectrographic method was tried in order to find out whether its results come closer to the conditions of true or total absorption, and how close the spectrographic observations correspond to the conditions of practical light exposure.

The direct results are given in Chart 2.

The transmitted light is given as obtained by the 3 methods for the 4 skin specimens in 12 columns.

With method (a)—The transmission is very pronounced even at 313 $\mu\mu$. We could not extend these figures due to the lack of filters for the far ultraviolet.

With method (c)—The transmission is about 150 times smaller on the average, due to the scattering of the light. This result cor-

CHART 2.

λ	Rabbit ear skin dry .060mm			New-born infant skin, wet .36mm			Callosity dry .30mm			Epidermis(Cantharides blister), wet .067mm		
	Filter, close	Spectro graph	Filter, far	Filter, close	Spectro graph	Filter, far	Filter, close	Spectro graph	Filter, far	Filter, close	Spectro graph	Filter, far
578 } 546 }	98	15		55	1.5		69	10		75	15	
		15			1.5			10			15	
491	78	11		31	1		63	7		75	15	
435 } 405 }	74	8			.8			6			15	
		8	1.7	15	.4	0	62	6	.3	60	10	1.7
401		8			.4			6			10	
391 } 380 }	68	8		12	.4		39	5		60	10	
		8			.4			4.5			10	
365		8			.5			4			10	
350 } 340 }	57	8	.6	11	.5	0	42	2.3	.1	65	8	.5
		7			.4			2			8	
334 } 313 }	40	7		6	.3		10	.7		51	8	
		6			<.2			0			8	
302		5			t			0			7	
297		4			t			0			5	
293		3			0			0			4	
289		2.5			0			0			3	
285		1.5			0			0			3	
280		.5			0			0			2	
275		t			0			0			1	
270		t			0			0			1	
267		<1			0			0			1	
265		<1			0			0			1	
263		<1			0			0			1.4	
260		<1			0			0			1.4	
257		<1			0			0			1.3	
253		<1			0			0			1.3	
248		t			0			0			1	
246		t			0			0			.8	
245		t			0			0			.7	
240		0			0			0			.5	
238		0			0			0			.3	
236		0			0			0			0	

Percent Transmission through Skin
after Three Methods.

t = trace

responds very closely to the one of Stenstroem.

The figures obtained by method (b) with the spectrograph lie between these two extremes, but somewhat closer to method (a).

Chart 3 gives the various coefficients, derived from the figures of Chart 2.

The corresponding columns show:

(1) The true absorption coefficients,

(2) A coefficient lying between the one of true and total absorption,

(3) The total absorption coefficient,

(4) The scattering coefficient, determined as the difference between (1) and (3).

A comparison between the first and fourth respective columns indicates clearly the preponderance of scattering over true absorption. In

CHART 3.

λ	Rabbit ear dry .060 mm				New-born infant wet .36 mm.				Callosity dry .30 mm				Epidermis wet .067 mm.			
	μ	$\bar{\mu}$	μ	σ	μ	$\bar{\mu}$	μ	σ	μ	$\bar{\mu}$	μ	σ	μ	$\bar{\mu}$	μ	σ
578	.2	138			.7	5.0			.5	3.3			1.8	12.2		
546																
491	1.8	16.0			1.4	5.6			.7	3.8			1.8	12.2		
435																
405	2.2	184	30	278	2.3	6.2	—		.7	4.1	8.4	7.7	3.3	14.0	26	22.7
401																
391																
380	2.8	18.4			2.6	6.6			1.4	4.5			3.3	15.0		
365																
350	4.0	18.4	37	33	2.7	6.7	—		1.3	5.5	10	8.7	2.7	16.0	34	31.7
340																
334																
313	6.7	19.7			3.4	7.2			3.3	7.0			4.3	16.4		
302		21.7											(6.0)	17.4		
297		23.3											(8.0)	19.4		
289		26.7											(11.2)	22.6		
280		38.5											(13.6)	25		
275													(18.6)	30		
265		40											(18.6)	30		
260													(14.6)	26		
253		40											(16.6)	28		
248		>40											(18.6)	30		
240		—											(22.6)	34		

Absorption Coefficients

case of the epidermis an estimate was made for the true absorption beyond 313μ , by the help of the observation made in a previous investiga-

tion, that nearly a constant difference exists between the figures in columns (1) and (2). These figures are only approximate and should be determined by direct measurement, an investigation which is planned by us for the immediate future.

CHART 4.

	PERCENTAGE TRANSMISSION			
	Rabbit ear 1 mm	New-born Infant 1 mm	Callosity 1 mm.	Epidermis 1 mm.
578	68.2	19	89	66
546				
491	1.5	4	85	66
435				
405	.7	.5	85	47
401				
391				
380	.15	.28	72	47
365				
350	.01	.22	74	54
340				
334				
313	.00	.04	47	37
297				(25)
293				(16)
289				(7.6)
280				(5.5)
265				(2.8)
253				(2.2)
248				(1.4)
240				(.6)
236				—

With the help of these absorption coefficients the approximate penetration through 1 mm. skin has been figured out from the first two specimens, and the transmission through .1 mm. epidermis was calculated from the last two specimens. These figures are given in Chart 4.

These figures represent a first attempt only to determine how the light actually penetrates into the skin. The exact solution of this problem requires the observation of more material, of course. We have only tried to gain an approximate idea how the light distributes itself through the various skin layers.

As approximate figures, convenient for the calculation we have set the horny layer as .01 mm.; the Malpighian layers (+ horny layer) equal .1 mm. and the corium (+ former layers) equal 1 mm.

CHART 5.

LAYER	mm	230	260	275	300	400	550 $\mu\mu$
		100	100	100	100	100	100
Corneum	.01	(52)++	(29)+	(34)+	(15)+	(5)	(2)
		48--	71-	66-	85-	95	98
granulosum Malpighi germinativum	.1	(48)++	(68)+	(64)+	(65)+	(36)+	(15)+
		.1-	3.2	1.6	20	59	83
Corium	1	(0)-	(3)-	(2)-	(20)-	(58)+	(81)
		0	0	0	0	0.5-	1.6
Subcutaneum	-	(0)	(0)	(0)	(0)	(0)	(2)

Approximate Distribution of Light through Skin

In Chart 5 the amount of light that enters the skin is called 100 (%) for each of the six selected wave lengths. The plain figures represent the percent transmission through the respective layers, the circled figures indicate the light absorbed by each respective layer. These purely calculated figures have to be corrected according to the observation of Bachem that the *corneum* and *granulosum* have a stronger absorption in the far ultraviolet than the *germinativum* and *corium* and that the *corium* absorbs stronger at about 400 $\mu\mu$. This correction is signified by + and - signs, without any attempt to determine the quantitative amount of the correction.

The outstanding facts of this chart are:

(1) Most of the visible light is absorbed in the *corium*, the longer visible rays even penetrate into the subcutaneous layers.

(2) Most of the near ultraviolet is absorbed in the *Malpighian* layers, but a respectable amount reaches the *corium* and is absorbed in it.

(3) Around 275 $\mu\mu$ practically all the radiation is absorbed by the *corneum* and *granulosum*.

This is the radiation with a maximum of anti-rachitic activity.

(4) On both sides of this area (260 and 300 $\mu\mu$) the radiation penetrates deeper, with a larger amount reaching the *germinativum* (and the *corium*). These are the spectral areas most active as to the production of an erythema.

(5) From 230 $\mu\mu$ on, practically no radiation is able to penetrate the horny layer of the skin.

We expect to present more complete and more accurate material in the near future. The present figures are given as an illustration of how the complicated problem of the penetration of light through the skin is to be solved.

SUMMARY

(1) A review of the ultraviolet work of Bachem, Kunz, and Reed is given.

(2) The disentangling of true absorption and scattering has been conducted through for a few wave-lengths.

(3) It has been shown that the spectrographic method does not give accurate quantita-

tive results as to the light penetration into the tissue.

(4) The approximate distribution of the light through the various skin layers has been given for the most important parts of the spectrum.

LITERATURE

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⁴The Penetration of Ultraviolet Rays Into Live Animal Tissues. D. L. Macht, W. T. Anderson and F. K. Bell. J.A.M.A. 90, 1928, 161.

⁵Some Measurements of the Transparency of Skin to Light. W. Stenstroem and M. Reinhard. Acta. Radiol. 1926, V. 553.

DISCUSSION

DR. NORMAN E. TITUS: I should like to have Dr. Bachem tell us if the material of these experiments were all irradiated at a very close distance or with what might be called a therapeutic distance. I have heard the statement made that in some of the experiments the distance from the source of light to the skin was six inches. Was that maintained throughout these studies, or was the burner at any period of these experiments far enough away for therapeutic radiation? I recall that some of the earliest investigations on the penetration of ultraviolet through the skin were conducted with an air-cooled lamp at a distance of six inches. Those who have tried to treat patients with an air-cooled lamp at six inches have found it practically impossible. Either the heat was too great or the reaction too severe.

DR. C. I. REED (Chicago, Ill.): Many features of this paper are clearer to me now after hearing it presented than they were at any time while we were working on this problem. This work constitutes an effort to straighten out some of the confusion that exists, as one will observe from the literature. Some of you will perhaps recall that three years ago I presented to this meeting the results of some experiments in which it was shown that some of the clinical effects of irradiation could be duplicated by irradiating the blood directly. That is, by passing the blood of a live animal through a quartz tube and irradiating the blood with the skin excluded. However, many other results that have been noted clinically could not be duplicated by this means. That gives the skin, then, a role of primary importance. When I came to Chicago a year

ago I found that Dr. Bachem was working in a little different way on practically the same problem; we have collaborated to some extent in trying to determine the role of the skin as a whole, and of the various parts of the skin in the production of the clinical effects of irradiation.

I am doubtful of the advisability to attempt to predict just what our results will be. We expect to pursue this problem further. I am not prepared to make any predictions, am not prepared to discuss the questions any further than that. I still insist that Dr. Kobak should not be permitted to beg off from his obligation to discuss the question, because from the experimental point of view there is a limit to the interest in the problem unless those results are correlated with clinical experience. He has had the clinical experience. We have had the experimental experience. I should feel that I was presuming quite a bit to attempt to discuss the thing any further from that point of view.

DR. DISRAELI KOBAK (Chicago, Ill.): Like other branches of medicine, the study of ultraviolet radiation is passing through a transitional stage from empiricism to rationalism. In the past the medical practitioner was content with clinical proof; today the proof is insufficient unless tested by the rigid rules of the modern laboratory. Proof of what goes into the tissues as well as where it is distributed is fundamentally needed wherever thermo and photodynamics are employed. The determination of the penetration of ultraviolet radiation is a different one. Very many disturbing and complex factors enter into the problem, such as the distribution through the skin; the condition of the skin; the source of radiation employed, the type of burner, the intensity of the source, the wave lengths studied, the time of irradiation and the distance employed. Because of the many factors that of necessity enter into the problem the conclusions have at times been faulty. Such a problem not only requires the most intelligent control but it requires the combined efforts of men oriented in closely related divisions of medical research. This problem needs the additional cooperation from a chemist—a physical chemist—in order to thoroughly stabilize the valuable contribution of the authors; a physicist and a physiologist. The need for a chemist is apparent because, following *penetration* and *absorption*, photochemical changes take place. Changes in reduction and synthesis take place following the irradiation of chemical materials, and by the same token similar changes must follow of materials *in vivo*. It is my impression that we have heard tonight a contribution of fundamental importance. I feel, just as Dr. Reed has expressed himself, that the work has not been completed. Probably this is the first of a series of studies, and comment upon this scholarly paper should be logically withheld until our next meeting when we might expect to have some information that may enhance the present experimental work of these authors.

PRESIDENT TITUS: Inasmuch as we have had such an interesting discussion I think we might ask Dr. Bachem to give us in closing what his idea might be in

correlating our clinical application of ultraviolet light; whether he thinks we should work for an erythema, whether he thinks we should not, what he thinks might be the results of overdosage, whether he has in his experiments seen bad results on skin specimens, and whether he would not try sometime in the series of skins that he obtains from different feet to observe what the effect of ultraviolet light is on the skin of the Negro. The question of the deposition of melanin in the skin is always bothering medical students. They always want to know what tanning does when you get it, and whether it is worth while to give ultraviolet to a Negro, and other such questions that we, knowing the skin less intimately than Dr. Bachem, would like to have just a little free advice on, in order to save our faces when the argument gets too warm in class.

DR. BACHEM: I am afraid that answering the many questions would require more time than is at my disposal, but I shall try at least to do my best to answer one particular question that I have been asked by our President: the effect of distance. We changed the distance quite a few times on account of the immense difference that occurred with different filters. In one case there was only about two or four per cent going through a filter, in another case 60 per cent going through, and we simply had to change the distance in order to get normal exposures on the plates. This of course involved the question whether the change of distance would have anything to do with our results, and so we changed the distance in order to find out whether that would effect the results.

We didn't find any difference as to the percentage of penetration. This is to be expected from a physical point of view. You might say that with the x-ray we have the pronounced effect of distance. That, for instance, in deep therapy we go fifty centimeters, i. e., twenty inches away from our patient in order to get a better distribution from the skin toward the interior, and even distant fields have been introduced with something like eighty centimeters, or one meter, i. e., forty inches distance. That is true only for the x-ray with the immense penetrating power of those rays that we use in deep therapy. This is entirely different with ultraviolet light. The rays that we use in ultraviolet

work have very little penetrating power, and whether we go farther away or closer to the patient, the effect is the same as far as penetration is concerned. Thus, whether we use a lamp from the greater distance as we do with an air-cooled, or with shorter distance as with the Kromayer, we cannot expect any perceptible variation in penetration. Of course if you go close to the skin with an air-cooled lamp you burn the skin, and the patient couldn't stand it closer than, let me say, about eight inches. But as far as the percentage of penetration is concerned, I wouldn't expect any difference of any consequence.

Now I come to the difference between colored skin and white skin. In these first observations that I mentioned we measured the penetration through colored skin as well as white skin and we detected certain differences. A very peculiar thing was that in certain areas of the spectrum it seemed that the visible light had a little more penetrating power in the colored skin, but then we later found that the colored skin usually was a little thinner, and it seems to me that the absorption is taken care of in a different manner by the colored skin and by the white skin. The colored skin leaves the absorption mainly for the pigment layer; the white skin divides it more proportionally for its various layers. I could not say for certain whether that is true. We are just preparing another experiment in order to answer that question. We have just produced various specimens of melanin and have those brought into solution and now we are able to determine the exact absorption spectrum of melanin. Of still more interest will be our next investigations covering a similar problem. It just occurred to our chemists that they got keratin in solution with practically no change of the structure of the keratin; now we will have a chance to determine the exact absorption spectrum of keratin.

Finally we might come to the problem of what in the upper layers of the skin actually accounts for the pronounced absorption in the antirachitic area, around 280 μ . Whether the keratin or one certain part of the keratin or something that is admixed to the keratin, like cholesterol or ergosterol, are all problems which we might take up in the future.

PHYSICAL THERAPY IN DEAFNESS*

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The purpose of this paper is three-fold; to report a series of cases substantiating the findings of Hollender and Cottle in the treatment of catarrhal deafness by physical agents, especially diathermy; to suggest the use of massive vibration, consisting of the simultaneous vibration of the ear and the surrounding area; and to present a new type of electrode and a vibrating board for use in these treatments. Hollender and Cottle suggest the additional use of galvanism and general ultraviolet irradiations, but it is diathermy that is more responsible for the beneficial results. Their work has already been duplicated by others, especially McKenzie in England and Kent in Australia.

It would not be amiss here to review the results of the experimental studies of Hollender and Cottle, with diathermy, on living dogs. These workers found that diathermy introduced by way of the ear canals alone did not reach the middle and inner ears because of loss of heat in the canal. They concluded that the maximum temperature is best obtained by the shortest routes which they considered to be along a path between the mastoid area on one side and the area anterior to the ear on the other side—the desired heat generated being at the site on the petrous portion of the temporal bone. Their summary of the actions of physical agents on the pathology in partial deafness, especially catarrhal deafness, is well stated and can with advantage be restated here *verbatim*. They say that “*diathermy*, as its name implies, is capable of heating through tissue. It is converseive in nature and created within the tissue structure. It is therefore endogenous. Converseive heat within a part is the most potent factor in production of hyperemia, and this results after diathermy administration.”

“The penetration and degree of heat from diathermy are always under control, but chem-

ical activity is increased in direct relation to increase in temperature. Structural changes in the mucous membranes of the middle ear, or fixation of the ossicles are influenced by diathermy. Absorption of calcified deposits is effected to such a degree that function may be partially or completely restored. By its action on the immediate circulation, its ability to produce hyperemia, cellular tension is altered and cellular activity stimulated. Exudates and fibrous tissues are disintegrated and muscle spasm relaxed.”

Their reasoning appears sound as far as the explanation of the results from heat effects are concerned, inasmuch as similar changes from diathermy have been found in conditions in other parts of the body. As for example, calcifications in glands and also in subdeltoid bursitis have disappeared under its influence. Resnick's recent paper bears this out. Changes in fibrotic structure do occur and this has been noted especially within the abdomen by Cherry and more recently by Scheffey and Schmidt. However, the changes cannot be entirely explained by the action of the heat produced. There is another effect about which little is as yet known, but which must be considered. This is an effect produced in an electromagnetic field by the action of currents of low wave lengths on the cells themselves. There is set up a state of resonance or oscillation within the cells. Recently, in an address at Cambridge, by E. Newton Harvey of Princeton, he stated that he was able to demonstrate, following the passage of an alternating current through a quartz crystal, vibrations ranging from 300,000 to 2,500,000 a second that caused pulsation in the isolated heart of a frog. These same waves have been shown to kill small fish and other forms of sea life. The action is intracellular, and it may be constructive as well as destructive. Dr. J. W. Schereschewsky, working with others on mice and fowl inoculated with sarcoma, obtained unbelievable cures with short wave lengths. Hallberg

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who has done considerable work in this field offers the following conclusions:

(1) Radiant energy can and does act physiologically upon the human body in many different ways depending upon its primary wave lengths or harmonics.

(2) The most minute amount of electromagnetic energy in wave lengths between 3 and $7\frac{1}{2}$ meters can cause a human body to increase the temperature of its blood to a much greater extent than can be accounted for by heat absorption in the ordinary manner.

(3) The entire human body may act as a resonator when excited by such radiation.

(4) Small groups such as individual cells, molecules, and even atomic structures forming part of the human bodies may be brought into a state of resonance to produce electronic disassociation and in that manner vary the hydrogen ion concentration value of the blood lymph individual cell structures, and their nuclei.

The high frequency machines in use are of frequencies ranging from 800,000 to 1,500,000, equivalent to wave lengths of approximately 600 to 220 meters. It is probable that these waves also may have a direct biological action, and that the converse heat produced is a manifestation of an electrochemical response, a reaction analogous to the heat production in chemical reactions.

I believe that the beneficial effects of diathermy in pathologic states will ultimately be by some such explanation. It is doubtful whether heat effects alone can be entirely responsible for the good results.

Although vibration in treatment of deafness has been used before, it was thought that it might prove beneficial in middle ear deafness where there is apt to be fixation of the ossicles and retraction of the ear drum. One of the physiological effects of vibration is that of massage, such as hyperemia produced by friction and motion. Inasmuch as no suitable vibrating appliances were obtainable different devices were made and experimented with. For an ideal vibrating device the following essentials were con-

sidered. It should produce or conduct actual vibration, as maximum as possible, and still exclude noise, because of the deleterious effects of the noise on the cochlea. It must be in close contact with or as near as possible to the part to be vibrated. Various substances, such as different metals and different woods, for the conduction of the vibration were tried, and given up when found unfit for the purpose. Noise muffling substances such as cotton, cork, sponge, cloth and rubber of various kinds were experimented with in conjunction with either wood or different metals. After several months of experimentation, it was found that the combination best suited was one consisting of a board three by six by three-sixteenths of an inch in thickness containing in its center a circular opening $2\frac{1}{2}$ inches in diameter. One side of the board was covered by a double sheet of pure para gum rubber, obtained through the courtesy of the United States Rubber Company. The rubber side was placed against the ear and face of the patient and the vibrator applied through the opening in the board against the outer surface of the rubber.

Experiments were simultaneously conducted for the purpose of trying to improve the electrodes and their method of attachment as described by Hollender and Cottle. The following essentials were necessary. The electrodes must be designed to carry a sufficient current without overheating. They must cover a sufficient and proper area of the aural apparatus and surrounding tissue, so that the distance between them should be as short as possible. They must be readily adaptable to the ear and fit exactly, so as not to permit any dead spaces where burns would result from sparking. Several models were tried and the one finally adopted for use was made as follows. An impression of the external ear and surrounding area was made by heating some impression compound in a holder until very soft, then pressing this firmly against the ear and holding it there until it was sufficiently hard to remove without distorting the impression. From this an aluminum cast was made. These electrodes were held against the part by a semicircular aluminum bar with sliding attachments that could be adjusted and tightened to hold the electrodes firmly in posi-

tion. It can be seen from this that the electrodes are individual for each case, and it is possible to obtain excellent contact. It is sufficient to say that no burns have ever resulted, and milliamperages as high as 700 have been used without any harmful effects.

Some interesting effects were noted with the use of the vibrating appliance. These were the production of heat about the ear and deep within the canal. There was also a loosening and discharge of secretions when present, post-nasal, or even probably from the eustachian tube. This could be noticed by the swallowing attempts on the part of the patient, and a feeling as if some obstruction had been removed. On examination of the external canal and ear drum following vibration marked hyperemia could be noted, and it is reasonable to assume that a similar condition was present in the middle ear. In no case was a cochlear effect, due to over stimulation noted, the only untoward effect at times being a full feeling in the ear after vibration, which disappeared on application of diathermy.

In conjunction with the treatment, the patients were given typewritten instructions and exercises for concentration of the mind when spoken to. In the main, these consisted of listening to conversation and the whispered voice with eyes closed and mind concentrated on the ear addressed. Lip reading was forbidden. There was also included exercises for use in telephone conversation, listening to the radio with and without ear phones, the use of numbers and words with high and low vibration rates. A few cases of nerve deafness, advanced catarrhal deafness with nerve changes, and cases with tinnitus were experimented with, but the results were not satisfactory. This report deals with 35 cases of partial catarrhal deafness, with no or very little nerve involvement. The basis of grading the degree of deafness was by use of the whispered voice, comparing the distance heard from the ear with the normal hearing distance.

The technic used was the following: Each ear was vibrated for two minutes using a high vibration speed. The vibrating board was placed firmly against the ear and face of the patient and the amount of pressure of the vibra-

tode against the vibrating board adapted to suit each individual case. Following this the electrodes were attached and a 25-minute diathermy treatment given. The milliamperage depended on the patient's heat sensitivity and varied from 250 to 700 milliamperes.

The minimum number of treatments was thirty and the maximum was ninety. Treatments were given when possible as often as three weekly. Improvements were occasionally noticed even after the first treatment. A lapse of treatment for as long as two months showed no retrogression. As a matter of fact it was noticed in these cases that the patients seemed to hear better. This was explained by the fact that having become reaccustomed to better hearing greater concentrating efforts were made by the patient in listening so as to keep up the advantage already gained. The only drawback was the onset of colds. These resulted in temporary setbacks that with the exception of one case, were soon overcome. In this case after a few weeks of improved hearing a cold infection of some severity produced a state of deafness as marked as that existing before the treatments. Further treatments were of no avail. When necessary, patients were given suggestions regarding measures to be taken to prevent colds.

The following results were obtained:

Degree of Involvement	Improvement
<i>One ear involved, 8 cases:</i>	
25% deficiency, 3 cases	Over 75%, 3 cases
50% deficiency, 4 cases	Over 75% 2 cases
	From 50-75%, 2 cases
75% deficiency, 1 case	25%, 1 case
<i>Both ears involved, 27 cases:</i>	
25% deficiency, 6 cases	75%, 3 cases
	50%, 2 cases
	25%, 1 case
	75%, 8 cases
50% deficiency, 15 cases	50%, 5 cases
	25% 2 cases
	50% 3 cases
75% deficiency, 6 cases	25%, 2 cases
	No improvement, 1 case

In conclusion it can be stated (1) that results have been obtained similar to those obtained by Hollender and Cottle. (2) That from

the increasing number of favorable cases already reported by different workers employing either diathermy alone or in conjunction with other measures, a means has been found for preventing the progress of deafness or improving the hearing in cases of partial catarrhal deafness.

DISCUSSION

DR. ELLIS G. LINN (Des Moines, Iowa): It is always of interest to hear someone present a subject who has worked out an improvement in technic and has convinced himself and his friends. I read Dr. Levy's paper with a great deal of interest, largely because I, too, have been interested in this phase of diathermy.

The essayist gives his treatments three times a week. I make it a practice during the first few weeks to administer the treatments more frequently than that. I usually treat the patients every day for a week, and, in rather severe cases, for longer periods as necessary.

I have adopted as a routine treatment to follow the diathermy, the slow sinusoidal current. I have used this plan for several years and am satisfied with the results that this combined method has given. I like Dr. Levy's apparatus very much. It is no doubt effective, as Dr. Levy has demonstrated. However, it lacks the very points I have always held to; that the current should be delivered to the part that is involved. I would cover an ear just as Dr. Levy does but with the apparatus slightly different. You are all familiar with my apparatus. It differs in several respects from other types of apparatus being used in this work, in that the affected ear is completely encased. In addition an attempt is made to heat the drum by means of a conducting fluid, such as saline into which extends a plug of cotton, moistened, and attached to an electrode which partially fits the ear canal. By this added means, a larger area is diathermized, and no doubt, the heat gets to parts of the middle and also the inner ear.

Tinnitus is a very annoying condition. I find that tinnitus can often be relieved to the same degree as impaired sound conduction. These methods are far from panaceas for the treatment of deafness. They represent an advance, and are eminently worth while being added to the measure which we now have at our command.

DR. M. H. COTTLE (Chicago): Dr. Levy's paper has been preeminently good in my opinion for the three reasons which he gave for writing the paper. The results this time come from another source, again substantiating, in spite of the variance of technic, findings which other workers have reported.

I believe Dr. Linn's technic is good and since all the technics are different and the results are the same, I think the simplest technic will be the best.

Of course, one could go into lengthy discussion on the whole problem. I can only emphasize the animal experiments which we did. These determined fairly well an anatomic basis for the positions of the electrodes. There is still considerable controversy on how

the heating of the tissues takes place. Suffice it to say that our knowledge on this subject is limited and that the most that we can now offer are theoretical explanations.

In closing, I wish to say that to Linn we owe much for the pioneering work with diathermy in deafness. Much of the progress which has been made is due to his efforts and to his original suggestions, although, of course, some work had been done in Europe a short time before Linn's contributions appeared in the medical press of this country.

DR. HAROLD HAYS (New York City): I am very glad Dr. Levy presented this paper. I was also happy to know that he is not an otologist and, especially, that he has done the experiments without any question of remuneration. I do not want to enter into a discussion on the value of the treatments we use.

I do not suppose any man in New York uses more electrotherapeutic methods than I do, and I think they are worth while. I have never found any who will definitely say that the use of definite therapeutics meant anything of extreme value.

It is utterly impossible to make any scientific statements as to the value of a treatment of this kind, whether temporary or permanent, unless the tests of hearing have been properly and carefully made. In this way it would be very easy to check up on cases to see whether relief was actually obtained.

A few years ago I invented a vibratory machine that does exactly what this machine of Dr. Levy's does; it is very simple and can be regulated by the patient and there is no more noise than in this machine. I have two or three in my office, although I am not at liberty to say that anything has been accomplished in a therapeutic way.

So far as diathermy is concerned, we have been using it for years in every kind of way to see if we get any kind of results. I cannot say that our results have been gratifying.

It happens that I am chairman of a special committee of the American Medical Association to deal with problems of this kind. We will gladly recommend any method which can scientifically be shown to produce improvement in deafened individuals.

DR. DENMAN: I merely want to ask a question of the essayist or discussors. I feel this is a most practical presentation of something that is new in some respects, and some old things revamped, and the omission to which I want to call attention is the lack of classification that Dr. Hays has suggested. I feel we can take home a much more practical working idea of this presentation if the essayists or discussors will go further and describe the mode of application; that is, the certain class or stage of so-called catarrhal deafness for which this method is of use.

The term, "catarrhal deafness" is a misnomer and ambiguous. Catarrhal deafness means that it eventually leads to eustachian obstruction with the final result of deafness, now called, catarrhal deafness.

Is this method applicable in any one of say, three stages? First, naso-pharynx involvement leading to eustachian obstruction producing a total diminution of hearing. The middle ear is uninvolved and its structures are normal. Would these gentlemen use this treatment in that stage?

Second, a combination of eustachian obstruction and a beginning of obstruction in the middle ear, slight fixation of the ossicles, intermittent tinnitus or perhaps no tinnitus; perhaps a second stage.

Third, a later stage that perhaps even an atrophy has taken place. The eustachian tube is thickened and there is a great deal of tinnitus and a pronounced loss of hearing.

I should be gratified if someone would specify in which of these stages, or all of them, this method is particularly applicable.

DR. LEVY: I searched through the literature as far as possible, took a special course in ear work, just so as to know what I was going to do. I do not expect to continue this. I salve my conscience by not charging for it, and I have learned one thing: Unfortunately, there are too many people going from one doctor to another, willing to spend their life savings on their hearing.

I hope, by presenting what I have done, respon-

sible men may take it up to see if there is anything to it. I selected my cases. I probably had the choice of three or four hundred cases.

There are one or two things I should like to add. First of all, practically all the patients told me they experienced a sense of deep heat when these things fit properly, and when everything works properly, they get that sense of heat deep in the ear.

In regard to tinnitus cases: I ruled those out, because I did not know much about it. These seemed to be due to many different causes. I would not take a case with such a thing present.

Another thing I want to bring out is the question of the shortest distance between electrodes causing current. One must have a tight fitting clip to hold the connection. If the connection is the least bit loose a sparking and a shooting sensation of conducting current across the face results. By using that device, with all connections tight that effect will not be produced.

Every patient gives a careful history as far as possible. I tried to select my cases by making a diagnosis first. I believe that my group included only patients with middle ear deafness, at least, so far as I was able to determine.



VALUE OF IODIZED OIL IN NASAL ACCESSORY SINUS DISEASE*

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For preoperative anatomic diagnosis of the sinuses Moriz Weil's "Kontrastfullung" by lead sulphate, Beck and Ramdohr's bismuth, Cavanaugh and Hubeny's barium, Van Osdol's neosilvol, and Filippini's "antrografia" by potassium iodide have been superseded by the use of halogenized oil introduced by canula or by the Proetz method. This type of observation principally concerns the tissue swelling in inflammatory diseases which, contrary to old ideas, is of clinical importance. When very frequently employed, as in our one thousand observations, it is somewhat idealistic in scope, but never impractical. In facility of performance it does not partake of research features more than is usual in clinical problems of equal complexity. In speaking of the method as a whole—both injection of radiopaque materials and their introduction by the Proetz method of "displacement" for "sinus mapping," we shall use the practical term *opaque injection and suffusion*.

Opaque injection and suffusion of the sinuses detect obstruction anywhere in the nasal system, and reveal normal extensions and capacity of cells with outline of filling defects. In office work we have scant interest for information which is only confirmatory of diagnostic evidence which might be more simply obtained. For the present, therefore, we may pass over the research side of intense bacterial infections, also foreign bodies, traumatisms and tumors, in all of which an acute swelling is present, and come to the more expansive problem, because of its baffling features, which is presented by non-suppurative sinus disease. This common disease is often latent, not only as regards its symptoms, but also in usual diagnostic signs. Frequently there is no discharge and, further, the dearth of granulation tissue makes for clear transillumination. Moreover, in view of the fact that for cure it principally calls for operation over a more

or less extensive field, considerable caution is necessary in the selection of the grade of treatment required. In making such decisions, if we rely on the frequently faint shadowing in the primary roentgenogram we are open to grievous error. We are, therefore, in a position of accepting as necessary a laboratory method because the unaided five senses are insufficient. Practically, the value of sinus mapping is to combat in all possible ways that nasal disease which is called, for lack of a truly felicitous nomenclature, chronic hyperplastic polysinusitis, and is also called chronic non-suppurative sinusitis, chronic catarrhal sinusitis, chronic sero-catarrhal sinusitis, polypoid degeneration of the antrum, hyperplastic ethmoiditis, hyperplastic sphenoiditis, etc.

The problem is naturally twofold: (1) study of the disease in general, (2) investigation of any case in hand in relation to such general information. The available information concerning chronic hyperplastic sinusitis in general has been built up largely with the support of iodized oil findings and a number of principles are recognized. Familiarity with these plus the necessary roentgen studies, will render possible at least a good working diagnosis, prognosis and gauge of progress. The writer has elsewhere enumerated values of iodized oil as for the individuals concerned, internist, roentgenologist and otolaryngologist, giving indications for employment of these fillings. Such a consideration rather suggests, however, that there is both mystery and apathy in the subject as a whole. If we possess interest in a problem and recognize its complexities, then ways, means and ends usually follow in the proper place and order. It is the function of this paper, therefore, to state a position regarding nonsuppurative sinusitis as a whole, either the established position or, in unfinished aspects, our own current attitude, sketching the part played by the opaque method in the acquirement of these opinions.

*Read at the eighth annual meeting of the American Congress of Physical Therapy, Chicago, Nov. 4, 1929.

Peculiar Features of Nonsuppurative Sinusitis

Chronic sinusitis is of three kinds: (1) Pure suppuration—a principally bacterial affair and readily diagnosed by the free discharge and by the opacity to ordinary light. (2) A mixed form which is suppurative because secondarily infected. It is very readily confused with the purely suppurative type, but shows less on transillumination and greater filling defects. Constitutional factors predominate in its origin just as in the nonsuppurative type. (3) *Chronic nonsuppurative sinusitis* has a very wide incidence dependent on several causes. (a) repeated colds, (b) suppurative sinusitis unresolved beyond the catarrhal stage, (c) influenza. A large portion of cases are associated with asthma. Most of these show definite thickening in the sinuses, but many show negligible thickening, there apparently being an added chemical fault which permits the thickening to occur in that class which tends to polyp formation. All ordinary nasal polyps are pathognomonic for this disease (Hirsch classification). If the polyps occur with suppuration then the form is the mixed form of sinusitis. Nonsuppurative sinusitis tends to a pansinus distribution, as shown by the distribution of the nasal polypi in the case, and otherwise usually only by the Proetz method. It is believed that in bilateral cases the ethmoids are always involved on both sides and to a greater extent than the maxillary. The sphenoid comes next in order of frequency, and the frontals last. Every suppuration in an antrum should raise the suspicion that this is a polysinus case, with the antrum suppuration an accident of more recent date.

The disease may run its course without obvious complications other than head pains and the common catarrhal symptoms, but it usually occasions focal infection.

Peculiar Mechanisms of Focal Infection in Sinusitis

The focal infection occurs in three ways, of which the third introduces a new conception differing from the ordinary ideas of focal infection. (1) In the mixed form the pus, either free in the cavities or encysted in the membrane, is absorbed and produces bacterial toxins in the

blood stream. (2) In the pure form without suppuration toxemia is produced—from the nasopharynx, it is believed, because pharyngitis is a rather constant complication of this form, sinusitis being a leading cause of pharyngitis. (3) The third method is entirely outside the blood and lymphatic stream and occurs through the nervous system, first through the fifth nerve, and then principally through the vagus. Important fifth nerve endings are, of course, buried in a pathologic fluid within these sinuses. This causes, it is believed, any or all of the diseases of vagus dysfunction (cf. Pottenger), namely, bronchospasms and inflammatory disturbances of the bronchi, irregularities in the cardiac rate, nervous indigestion and spastic colitis. There are cerebral disturbances also such as the frequent finding that subjects of this latent type of disease have a certain nervous character and constitution, and a mental keenness which the intellectual type of life heightens, and tend also to emotional disturbances. Their pursuit of logic and consistency drives them to greater strain, thus aggravating the pathological focus. They tend, therefore, to work on a tension and be deficient in physical contentment. Another apparently nerve-borne complication is involvement of the eighth nerve to a degree not commensurate with the amount of toxemia present. An important part of the problem of mixed deafness, progressive deafness, and minor types of vertigo must be laid at the door of even milder degrees of nonsuppurative sinusitis. A similar combined type of focal infection is seen in arterial hypertension with myocardial degeneration coming practically equally from the tense type of life and from chronic toxemia, contributed to in both respects by this disease, i.e., both by toxemia and nerve derangement. Somewhat different are those eye diseases due to hyperplastic ethmoiditis and sphenoiditis which have been very well covered by the pioneer work of Sluder, and although non-remote probably illustrate the combined type of focal infection. We pass over, as sufficiently well recognized in the American literature, the pure toxemic type of focal infection such as tonsils are capable of causing, which could be equally produced by the lymphoid tissues of the nasopharynx or by pus infections of the sinus itself. The latter are probably purely

blood-borne, principally staphylococci and streptococci and are to be suspected from the examination. In the absence of pus, on rhinoscopy or irrigation, however, but with thickening within the sinus, any focal symptoms are strongly presumptive of nasopharyngitis often caused by latent sinusitis. This origin of toxemia from polypoid disease is, we believe, not sufficiently recognized.

Sinusitis Problems Worthy of Full Attention of Internist and Laity

There is, therefore, an extensive list of chronic maladies which seem to warrant search for latent thickening in the paranasal sinuses. Let us consider the human aspect of this. There is no greater private grief than that of a man who is ill, but whose diagnosis is not understood to the point of granting him some social allowances for his functional disability. And there is no greater problem in public life than that of the man who is really ill, particularly nervously, but passes a good ordinary physical examination or insurance examination, and proceeds to reflect in his decisions this disordered physical life, promulgating for others such dicta as are emotionally acceptable to himself, in his confidence that he is an example of normal life and reaction. Many times the story of a sinus involvement involves these human distresses, making us look forward to a really widespread appreciation of hyperplastic sinusitis. Naturally the realization of this can come to a physician best by the surprises of his own practice. To this frequency every worker with the halogenized oil will testify.

THERAPEUTICS

Therapeutically the chief subject for sober investigation is an operative type of relief. To appreciate the frequent failure of conservative methods, one need only consider the cases in which thickening has developed without any closing of the ostia or generation of discharge. Aeration and drainage, therefore, have by no means the importance in this disease which has always been credited to them. Mithoefer and Uffenorde have shown that only complete denudation of the maxillary sinus (Caldwell-

Luc) has a good possibility of eradicating the disease there. Cases apparently resolving following window operations probably all retain an abnormal type of membrane with increased fibrous element, so that 25 per cent of them will revert in subsequent inflammation it is believed. We do not condemn the idea of incomplete operation if a diagnosis has been made covering the extent of the disease, and the patient understands the nature of the difficulty and understands that a conservative attempt may have a certain hope of giving complete *symptomatic* relief. It is true that the need today is for conservative methods of treatment until the laity, the general practitioner and the biochemists are ready for a further advance. The writer, therefore, considers it a proper attitude to rely largely on thickening findings when considering radical operation of the maxillary sinus by Caldwell-Luc method. On the other hand, no operative relief should be planned locally without some survey being made of possible involvement in some other sinus altogether. We believe, therefore, that the consideration of surgery is the proper approach to the therapy of non-suppurative sinus disease, even though it may be followed by a decision to use non-surgical treatment.

Conservative methods must be aggressively supplemented by constitutional care to aid body chemistry. It involves the avoidance of any protein sensitization, alkaline diet, with free fluid intake, reasonable amount of ultraviolet general therapy, avoidance of strain in life, avoidance of colds, cold vaccines, reasonable amount of home and office treatment for aeration and drainage, also relief of vagotonia and hypoglycemic reactions, promotion of all endocrine therapy, restriction of intestinal putrefaction, perhaps use of lactose, and a proper supply of vitamins.

Standing aloof from these just expressed positions are those whose hopefulness or spirit of optimism is founded on the tendency of the disease to be latent. Since almost all cases with definite thickening become manifest with keenly distressing symptoms at some stage, we feel that an expectant attitude can only properly be taken when a complete survey has been made anatom-

ically and little pathology found. A further aid is a complete general physical examination, which will usually reveal constitutional affections when the sinuses are thickened. The internist will probably advise inauguration of steps by way of relief. One must always here be mindful of the fact that such patients fall victim to the complications often at an age which is a contra-indication to vigorous treatment. The proper position seems to be midway between one of aggressive care of all cases and one which would take seriously only such as show glaring complications. There is no way of establishing a rational position without a survey of the sinus area for thickening which should parallel the course of the disease. It is undoubtedly true that cases with similar symptoms vary widely in the thickening and polyp formation, which we tend to attribute to some chemical fault as some enzyme deficiency. Our progress is considerably impeded until we know what this fault is. A deficiency in epinephrin in the body seems to be associated with development of thickening, but there must be some further element which is also deficient, of which those postulated by Boldyreff as formed by the pancreas and absorbed from the intestines during the periodic activity of the latter, would be suspected. When there is no thickening, the use of the nasopharyngoscope and repeated observations must guide as to the involvement.

Non-Surgical Methods of Treatment on Trial

Opaque measurements form a very exact guide as to the success of non-surgical methods applied. Constitutional chemical aids have already been enumerated. As to local physical therapeutic measures our experience is as yet insufficient to justify conclusions. There are apparently no obvious short cuts to cure by means of heat and light. A typical case is the following, treated by diathermy:

Mr. K. A latent polysinus case, came for cough of two months' duration. First degree diffuse thickening plus large solitary intrasinus polyp in each antrum.

Ten treatments diathermy 650 m. a. to right side (daily).

Ten treatments diathermy 650 m. a. to left side (daily).

Films (ordinary roentgen) show no absorption of polyp. The bronchitis cleared up under dietetic and general regime. The polyp is better visualized without the oil, but the diffuse thickening is visualized only by the opaque injection used. Similar indifferent results have been obtained with the local application of the leukodescent light and arc light to the sinus region of the head, although some symptomatic relief of the pains may be experienced.

Problem of the Residual Sphenoid and Electrical Agencies

Non-surgical methods come into question especially after a chief surgical relief has been attempted. The typical problem is that of the residual sphenoid infection with thickening and discharge after the maxillary and ethmoid infection have been cured. This is so frequent that small regular sphenoid sinuses should be stripped of the membrane as is the maxillary. Irregular extensions, revealed by opaque injection and suffusion, prove contra-indications for stripping and provide recesses in which disease remains in spite of good aeration. We feel that zinc ionization offers the best hope for it, but no cases have been observed for a sufficient period to admit of judgment. Moreover, five milliamperes frequently cause pain and are inadequate to attain a success in one or two applications.

Therapeutic Influence of Iodized Oil

Some apparently beneficial results of diagnostic use of iodized oil have appeared in twenty cases. The usual report is that a relief in symptoms and promotion in drainage have immediately followed the application of the oil. We attribute this chiefly to the physical emollient properties of the oil. An interesting effect was observed in the following case:

Miss M. complained of blepharospasm and lacrimation. Ocular findings negative. History, old window operations in antra nine years before, with postoperative treatment of one year. Suffusion showed no frontal or anterior ethmoid

aeration. Bilateral ethmoid operations and intranasal frontal performed March 1, 1929. On reexamination by suffusion Oct. 1: Left side, small asymmetric frontal revealed no filling defect or obstruction. Right side, two days later, showed large well filled sinus. An immediate improvement in the ocular symptoms followed this right suffusion and persisted for one week. One month later repetition gave equally favorable result. We are at loss to definitely ascribe the improvement given.

Values in Technic

The subject of technic may properly be left to the initiative of the worker whose interest is aroused in latent sinus disease. The abbreviations in technic which are possible should come only after a period of adherence to the more painstaking methods of introduction of the oil. A few suggestions will, we believe, heighten the value of the results obtained.

1. Iodized oil diluted with petroleum products gives a good flexibility in specific gravity, surface tension, viscosity, and translucency. One in three shows details in three dimensions and permits standardization of roentgen technic with minimum number of exposures.

2. Complete fillings by injection and one-fourth to two-thirds unilateral fillings by suffusion are best.

3. Suffusion carried out in the roentgen room eliminates from the protocol all accidents likely to go unnoticed in traversing an intervening distance.

4. Apparatus may be reduced to a minimum by utilizing auto-displacement exercise (chest suction and pressure exerted on the nose) for inducing fluid movement.

5. Complete unilateral pansinus fillings are promoted by the Proetz method by exaggerating the Proetz position, both the prone and sphenomethmoid. For the prone plus 30 degrees, a forked tubular apparatus is desirable.

6. Reexamination for delayed emptying (Proetz) has several merits. It should properly involve the keeping of some protocol of head po-

sitions and nasal respiratory variations during the 72 to 96 hours.

7. Horizontal direction of roentgen rays for incomplete fillings needs no elaboration.

SUMMARY

The Problem of Latency

Opaque injection and suffusion are required in non-suppurative sinusitis because of its several types of latency. (1) Because of the minor nature of many of the local symptoms attention is not directed to the paranasal sinuses and also, over periods of years, there may be no symptoms. (2) In cases coming to the routine nasal examination the disease may escape detection because it may be negative to routine rhinoscopy and transillumination. (3) In the absence of complications the disease may be deliberately ignored. (4) Complications may be seen, but due to our lack of experience they may not be appreciated as such.

The Consideration of Surgery

Opaque injection and suffusion are valuable as foundation for rational surgery: First, surgical methods always might be found necessary, and great care is therefore needed in discrimination. Second, the number of sinuses to be treated, and the denudation of thickening, if any, must be decided. The preponderance of the disease must be overcome in order to validate the constitutional methods of therapy. Measurements of diseased masses give an appreciation of per cent relief to be expected by removal. Surgery is guided by iodized oil findings before, in interims, and in the final opinion of result. Conservative methods, if explained to the patient along with roentgen films, are often justifiable.

Rational Optimism

Optimism, necessary to medical treatment, must be rational. Opaque injection and suffusion are necessary to support any of the following optimistic statements in order to insure their scientific validity: (1) "There is no sinus disease. (2) It is limited to one or more sinuses. (3) It is capable of spontaneous cure. (4) It is unlikely to produce severe complications. (5) It

is unrelated to the minor nerve and other physical peculiarities of the patient, and the latter are to be considered normal phenomena.

There is always the companion problem of a chemical constitutional state of the body, involving attention to a list of desiderata in which allergy, endocrines, and the vitamins lead. Local non-surgical measures should be tried in many cases, but results must be proved by laboratory methods before their acceptance as essential. There is probably a field for such measures, particularly of electrical nature, following the surgical relief. Therapeutic value of iodized oil is very inconstant.

CONCLUSION

The latency of chronic hyperplastic polysinusitis bespeaks for clinical diagnosis, roentgen laboratory aid with opaque injection and suffusion. The importance of this disease makes it the main field for usefulness of this method. Recognition of the widespread problem will come only from familiarity with the peculiarities of the anatomic changes in this disease.

DISCUSSION

DR. HAROLD HAYS (New York City): Frankly, whether we make our diagnoses with iodized oil or not, we have to be very careful about making our patients submit to surgical procedures for the various diseases that are supposed to be caused by sinus infection. The longer I practice medicine the further I get away from radical procedures on the sinuses. There are many patients who present themselves with thickening or hypertrophy of the sinus mucosa. These patients offer a problem whether they should be treated along conservative lines or whether they should be asked to submit to radical procedures.

I know a number of rhinologists in the United States who are constantly doing large numbers of sinus operations. I wish to say emphatically that in my opinion these men are doing their patients more harm than good. I know many rhinologists are using ultra-conservative methods, and I say just as emphatically, these men fear to do necessary operative work. Thus there are two types of specialists: One, too conservative, and the other, too radical. The question of accurate diagnosis is paramount. One cannot be too careful and thorough before deciding on the program of treatment.

Dr. Fraser works in a place where he has the opportunity to examine patients very thoroughly. I know they use conservative methods. At the same time, I

cannot see how he can come to the conclusion that the only way to clear up indefinite conditions in the body system is by radical surgery, because I consider sinus surgery radical surgery. For example, a person in New York suffering from a chronic thickening of the nose at all times, has neuralgia pains in his face at times, is run down in the winter, but in the summer he feels well; the kind of a man, who so long as he is confined to sedentary work and cannot get away from his job, is always troubled with his nose, but on the contrary when able to buck up, has no trouble at all with either his nose or throat. Should a man like that be subjected to radical treatment?

In other words, we have many means at our command which afford these people relief from their aggravating symptoms. I, personally, have seen very, very few cases in which radical operation on the sinuses has resulted in absolute cure. As long as you are between such two extremes, the question finally resolves into treating your patient as an individual entity.

DR. FRANK J. NOVAK, JR. (Chicago): The main thesis of the paper seems to be the importance of exact anatomic diagnosis in the management of any sinus problem, and the value of iodized oil in the achievement of exact diagnosis; then, diagnosis having been reached, the conclusion is that radical surgery is the procedure indicated.

In my opinion, the question of greatest importance and interest is that of etiology. Are we not dealing with an end product when we examine the nose and arrive at a diagnosis of obstructed ostium and thickened membrane in the sinus? Is that not the general condition, and if it is, what may that general condition be?

About nine years ago, and again about five years ago, in papers which I published I speculated on this proposition. Two years ago at the meeting of the Academy of Otolaryngology in Detroit, I presented what I believed then (and more strongly do I believe it now) to be the basic fundamental change occurring in the human anatomy which is responsible for this local expression within the nose. At the Detroit meeting, I reported on twenty cases of hyperplastic sinus disease in which every patient exhibited a low basal metabolism. Since that time, a larger series of cases have proved to my mind that the basal metabolism in these conditions is invariably low. Judging only by the clinical progress of these patients under treatment and regarding them as hypothyroid cases I am convinced in my own mind that the ductless glands are the basis of this local expression of pathology in the nose.

DR. FRASER: Anyone who looks through my paper carefully will find that surgery is not advocated wholesale. Dr. Hays has been kind enough to say that in our own clinic we are conservative. Most of our patients keep busy all day with the regime of their hy-

gienic, constitutional, and non-surgical relief program. The failures of these usually respond to surgery which they are allowed to have.

I appreciate very much the point of view of Dr. Novak. I believe that the patient who is interested because he complains, or because he fears for the future, is entitled to not only the metabolism test, but a glu-

cose tolerance test, a barium meal, and a complete allergy test. We have found metabolism usually but not uniformly low—indeed as high as plus 56. Attention to the associated hypoadrenia—also often found and treated by glandular feeding—gives us the more direct and encouraging results. Perhaps we have unusually chronic cases.

PHYSICAL THERAPY IN INDUSTRY*

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The use of physical therapy in industrial medicine had its inception, in my opinion, with the establishment of industrial medicine and surgery as a recognized field of application.

The original use of physical therapy was largely secondary and incidental to the surgical and medical treatment rendered. The possible exception to this was in heat prostration or "insulation," in which condition hydrotherapy was used as a specific remedy, and is still perhaps the outstanding physical therapy measure utilized in "our" field.

Massage and hydrotherapy were the early forms of treatment, and with the opening of industrial hospitals it was dignified with its own department to operate in.

The objective in those days, was twofold; first, to reduce the period of temporary disability in fractures, dislocations and sprains by massage and manipulations, and, second as a place to refer those patients with plenty of subjective complaints or vague diagnosis, hoping, I presume, that the psychic effect would be beneficial. The results in the first instances were as tangible as the limitations observed in the second.

The lesson was brought home that medical supervision was necessary and that the direct results were in proportion to this supervision. It was evident that just as a druggist could fill a prescription or an x-ray technician turn out a diagnostic negative or a nurse give a typhoid

patient a Brand bath, so could physical therapy treatments be given, but that in no condition were they capable of diagnosing the underlying condition or determining the physiological effect desired.

With this supervision it was recognized that each patient was an individual problem and that while a general classification could ordinarily apply, complications frequently arose beyond the scope of a technician. A simple dislocation of the shoulder presents an entirely different picture for treatment than one with nerve involvement. Likewise, the progress of each case may vary from day to day and, logically, so must the treatment.

In the case of heat prostration, the condition of the individual changes more rapidly and the treatment must be so adjusted as to keep pace with it. I have seen a patient with heat prostration properly placed in an ice bath, between hot bricks, back in the ice bath and back between hot bricks all within twelve hours.

It was learned through this type of supervision that an indurated sutured scar on the side of the jaw could only give the results expected of it after the removal of a chunk of steel which had been discovered by subsequent x-ray. Likewise, that a wrist deformity in a fractured radius could not be corrected until a dislocated *os lunate*, which was overlooked by both the x-ray department and the surgeon, was taken care of.

The increased interest and supervision of these details increased the indications for the

*Read at the eighth annual meeting, American Congress of Physical Therapy, Nov. 4, 1929.

proper application of physical therapy, and the results were in direct proportion to it.

Fractures of the lower extremity now come up to the weight-bearing stage with little joint impairment and good muscle tone.

In the second class of patients which are referred to us on "general principles," a more careful examination added to our increasing experience, has frequently uncovered a definite pathology which in many instances required other forms of treatment. Our strained backs showed quite often, fractured transverse processes or osteoarthritis; our sprained knees semi-lunar cartilage tears.

The war developed a situation and a problem similar to that confronting our industry, but intensified and concentrated a thousand-fold more. As a result intense study followed. The service was expanded to include muscle re-education, vocational training and rehabilitation. Great strides were made in the electrotherapeutic field.

The use of physical therapy service in industry which heretofore was practically limited to the hospitals, has now expanded to the dispensaries and industrial surgeons' offices. Physical therapy institutes were created. Industry being largely concentrated in large civic centers, it was logical and comparatively easy to make this expansion.

It has as yet been impractical to establish vocational training or rehabilitation even in the largest industries except in certain individual cases, for the reason that this activity could only give results when concentrated and under qualified supervision. I believe, however, that this form of therapy is entirely practical in the larger cities with all the industries of the district to draw upon.

We were warned early in the post-war period that, with its increasing popular demand, this field would be invaded by the "irregulars" and non-medical practitioners—and it was; that overzealous manufacturers might attempt to sell imposing equipment to those in the profession having no training or qualifications in this field—and they did; that the service would get out of hand and accordingly receive a black eye—and it did.

It would seem that we have now arrived at the cross-roads of its application to industry and that the work this national congress is doing in simplifying and standardizing the department and its personnel, should continue unceasingly; that your standards of qualification for professional membership shall be kept up—and the educational facilities in this field encouraged and classified; likewise the institution established for both consultation and treatment be standardized and developed all to that end toward which we all strive and never attain—perfection.

(Discussion of Dr. Ogden's and Dr. Rebhorn's paper to appear in March issue following Dr. Rebhorn's paper.)



CONTRA-INDICATIONS TO THE USE OF PHYSICAL THERAPY IN THE TREATMENT OF GOITER*

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A decade ago considerable doubt existed in the minds of most authorities with regard to the correct method of treatment of toxic goiter. It is probable that the majority of physicians favored surgical measures, but the somewhat high mortality rate, even in the experience of the most skilled surgeons, caused many to look with doubt on this method of procedure. The rather high percentage of recurrence, together with the frequent failure to cure, added considerable support to the opponents of surgery.

The roentgen ray apparently was making rapid progress in all forms of therapy, and I distinctly recall the many arguments that were advanced in favor of this method of treating hyperthyroidism. These contentions, coming from such able authorities as Aub and Means, naturally carried a strong conviction, and were well supported. Roentgenologists and internists began reporting large series of cases with a high percentage of relief, improvement or cure. The surgeons, admitting their own failure to cope with the dreaded postoperative crisis of exophthalmic goiter, supported their claims with equally remarkable statistics. The majority of physicians were doubtful; they were swayed one way by some well presented discussion, then leaned the other way after reading some able paper.

About the same time some of the advocates of physical therapy, aware of the great advance made by this branch of therapeutics during the

world war, added their voice to the argument. If roentgen ray could eliminate the necessity for surgery in the treatment of hyperthyroidism, they maintained that diathermy and ultraviolet light could do the same.

In 1922, against some opposition and with considerable skepticism from other members of the group, I introduced into our clinic one of the first physical therapy units. This department met with immediate success from the patients, gradually overcame the opposition of the physicians, and has grown to be very popular and successful. Under the able guidance of Dr. J. C. Elsom, we have learned to recognize its possibilities as well as its limitations. It is with almost daily regret that we see this excellent therapeutic agent brought into professional disrepute through the dishonest claims of some of its unscrupulous supporters. For ten years I have been making a continuous study of the most successful method of treating goiter, and I have yet to find any real evidence in support of physical therapy as a form of treatment. I have studied at all of our best goiter clinics; I have read and abstracted countless articles, have corresponded with leaders in this field the world over, and I find them generally in accord with regard to the treatment of goiter.

Marine and Plummer are responsible for establishing order where chaos previously prevailed with regard to the successful cure of hyperthyroidism. In 1912 Marine claimed that the use of iodine would temporarily cause a re-

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version of the hyperplastic gland to the colloid state and with it a short respite in the toxic symptoms. During this brief period of partial abatement of the hyperthyroidism, surgery could be performed with comparatively little risk and with far less technical difficulty; this was not proved until 1922 by Plummer. Almost overnight the dreaded postoperative crisis was eliminated to a great extent in the majority of properly prepared cases. The surgical mortality rapidly fell and many lives were saved. It was possible with the use of iodine to operate upon patients with exophthalmic goiter who could never have come to surgery otherwise. Formerly such patients probably would have been given roentgen ray or physical therapy treatments in a desperate hope that the disease might be ameliorated or checked.

Today this has been entirely changed. Patients, who are brought to the clinic in an advanced crisis with a temperature of 103° F. or 104° F. a hot dry skin, dehydrated from continuous vomiting and diarrhea, with a pulse rate of 150, perhaps in a delirium or a psychosis, may, within twenty-four hours, be on the road to recovery, and within three days be out of bed with a normal temperature; the gastro-intestinal crisis is controlled, the pulse rate is considerably slower and the mentality approaches normal. Such a transition would never have been possible before the advent of iodine in the treatment of these cases.

The use of the roentgen ray was often of value for patients considered too desperate for surgery; in others it was of value in sufficiently reducing hyperthyroidism to permit operation. Perhaps the chief opposition to roentgen ray treatment was due to failures in the hands of incompetent technicians, the long period of absence from work, the frequent failures to cure, and the fact that even in those patients in whom the disease was partially arrested the toxic effect on the heart continued. This is the principal objection to all methods that do not promptly and effectively eliminate hyperthyroidism, restore the metabolic rate to normal and relieve the cardio-

renal-vascular system of the extra load imposed upon it. We have all seen cases in which a spontaneous cure eventually resulted, even though therapy of any kind was not used. The result in these burned out cases of hyperthyroidism was an enlarged, weakened heart, possibly with auricular fibrillation, hypertension and damaged kidneys.

With the use of iodine all these objections were speedily eliminated. It was possible within two weeks' time to operate on even the most desperate cases. Again there came into disrepute a most valuable therapeutic agent, because of failure to properly appreciate its limitations. Because of the remarkable therapeutic effect of iodine on cases of exophthalmic goiter, certain physicians failed to realize or could not be convinced of its dangers as well as its beneficial action. Following a brief period of temporary improvement, these patients developed a tolerance to iodine and the most favorable time for surgical intervention was past. More and more we are faced with these "iodine fast" cases and the risk of operation has increased tremendously. After having abandoned the use of the ligation and stage operation for several years I have been forced to return again to these procedures with such patients.

Since it is evident that any unnecessary delay in the relief of hyperthyroidism only leads to serious impairment of the cardio-renal-vascular system, it must be apparent that physical therapy is absolutely contra-indicated in any form in the treatment of toxic goiter. Failure to eliminate promptly the toxic effects of the goiter results in development of myocarditis, hypertension, nephritis, and chronic passive congestion of all viscera.

There is no indication for the use of physical therapy in the treatment of non-toxic goiter. The simple colloid goiter should be prevented in childhood by the use of iodine. It should be disregarded in adults unless large enough to cause pressure symptoms when it may be removed. In my opinion all adenomatous or nodular goiters

should be removed after the age of twenty as a protection against the future development of toxicity, malignancy, intrathoracic goiter and large disfiguring growths. Roentgen ray or physical therapy has to my knowledge no effect on these growths, and iodine, if continued long enough and in sufficiently large doses, may lead to the development of iodine hyperthyroidism.

Although physical therapy is definitely contra-indicated in the treatment of goiter, I believe it offers a valuable adjunct to surgery in the successful postoperative care. For many years all of our patients have been sent to the physical therapy service of the dressing department for the postoperative care of wounds. I believe that the use of the infra-red light and the large baking lights facilitates drainage, promotes healing and greatly improves the appearance of the scar. In fact the latter is of more concern to many patients than the successful cure of the disease.

There is a possibility that ultraviolet light may play an important role in the treatment of chronic tetany, one of the most serious complications of thyroid surgery. In 1925, I had the misfortune to have an unusually severe case of this kind. All known methods of therapy were tried, but it finally remained for the patient to take 600 grains of calcium daily in order to prevent convulsions. At this time I became interested in the effect of ultraviolet light in rickets; since tetany was likewise a calcium deficiency condition, Dr. Elsom and I decided to try this on our patient. The effect was most interesting. We began by reducing the dosage of calcium one-half. Within three days the blood calcium had fallen from 10 to 7 and mild symptoms of tetany returned. The ultraviolet light was started with a two minute exposure and gradually increased for three weeks. After a three weeks' rest period the patient's condition remained the same, so the amount of calcium was again reduced one-half. A year later the patient was taking only 74 grains a day after three short courses of ultraviolet. Whether or not it would be possible to eliminate the use of calcium entirely, must be determined by further study.

During the past year, I have conducted a study with the cooperation of fifty American and European surgeons on the results of operations performed during 1927 and 1928. There were 3,189 thyroidectomies and ten cases of tetany in this series. I have communicated the result of the preceding case to these surgeons and hope in another year to learn the effect these men obtain.

I believe that physical therapy has a definite place in medicine, but not in the treatment of goiter. I use it on myself to keep in the best possible physical condition during the sunless winter months, so that I can the better care for my practice; however, I am convinced that it is contra-indicated in the treatment of any type of goiter.

DISCUSSION

DR. MAXMILLIAN KERN (Chicago, Ill.): One of the outstanding points that Dr. Jackson brought out is the existence of a chaotic nomenclature in relation to the present conception of goiter diseases. Almost every time I hear a talk on goiter, demonstrated by slides, I expect the first slide to give us some catalogued idea about the various types of goiter. I have yet to find two or three slides that are similar. Every one has his own idea.

The thing of importance is to determine which is the surgical type and which is the medical type. Dr. Jackson mentioned that we have two schools with reference to Basedow's disease. I have believed in Warthin's School at Ann Arbor, to the effect that the toxic adenoma or hyperthyroidism with toxicity is entirely different from a Basedow's disease, in the sense that toxic adenoma may develop all the symptoms of a toxic thyroid which in every way will resemble a Basedow's disease. However, that situation has developed distinctly from a condition which has pre-existed from a state that was either a colloid tumor or a simple adenoma or a nodular adenoma or of the cases mentioned by Dr. Jackson, whereas Basedow's disease, in my opinion, is a systemic condition—a condition which has pre-existed in the patient since birth, and has remained dormant until such a time when something has set fire to the nervous system of that individual and has over night developed all the symptoms of exophthalmic goiter.

The cases which Dr. Jackson showed, which are supposed to be shell-shock, are perfect examples of that type of exophthalmic goiter. Incidentally, I want to say that I have seen a good many cases of exophthalmic goiter where the basal metabolism was not unusually

high, not nearly so high as an adenoma that had lasted long enough to develop toxicity.

This is the type of Basedow's disease, if it is properly differentiated from the toxic adenoma, that does not fall under the application of the surgeon, not at all. It absolutely must be treated properly for a long time by an internist who realizes that the mere enlargement, if there be one (and in most cases we don't find it), is only one of many other symptoms which include such things as nervousness, tachycardia, the important sign of dermatographia, tremor, sometimes exophthalmos and sometimes a high basal metabolic rate. When one realizes that and accepts this theory, one will immediately realize that the cutting out of the visible lump cannot possibly change the entire system. It succeeds temporarily in merely changing the metabolic action or the toxic action of the thyroid gland. Usually we find recurrences in only such cases, and because of the lack of differentiation of this particular type from the other types of goiter, the internists blame the surgeons for recurrences and the surgeons blame the internists for recurrences and there is never a common understanding on the subject.

With reference to the prolonged use of iodine and its danger, I heartily concur in this. It is indeed dangerous. I have seen, a few years ago, fifty cases of definite conditions of toxic symptoms of thyroidism appear in patients where, in every case, it was brought about or induced by the eating of some tablets containing iodine or containing thyroid extract. Marine and Kimball's iodine theory of the pre-adolescent type of goiter in the school children has brought about such a chaotic misconception amongst the doctors treating this condition that it has been responsible for more goiters today than Nature herself has made by making the mistake of putting a little iodine in the water. I find many cases with definite thyroid symptoms that have been caused by people either stimulating their virility or their figure by taking iodine tablets.

The other point which interests me is the frankness with which Dr. Jackson started his paper in saying that physical therapy has no role in the scheme of the treatment of goiter. I should like to amend that by saying that physical therapy has no role in the treatment of goiter by surgeons, but it has some slight role in the treatment of the patient in general. It is a very common thing that just as often as we find a basal metabolism disturbed, so often do we find a disturbance of the blood picture, and with that disturbance of the blood picture we have usually a certain form of anemia whereby there is a general disturbance of the phosphorus and calcium. In such conditions I have found it a good principle that, rather than to wait to get an

isolated case of tetany due to a parathyroidectomy for which the doctor neither contracts nor gets paid, it is worth while to give a routine course of treatment. I don't own or possess a lamp in my office but I see that they go through a regular course of such treatment, properly guarded, seeing that they don't get it by the masseur in their club, or buy a little lamp and give themselves treatments. Those are the things that I think ought to be stressed. Scientific physical therapy should come to the fore and explain wherein calcium metabolism can be and must be controlled in order to avoid some mild symptoms of tetany after thyroidectomy.

DR. VICTOR E. LEVINE (Omaha): I was very much interested in Dr. Jackson's paper and also in the discussion of it by Dr. Kern. Having heard the medical and surgical aspects, permit me to say a few words with reference to the hygienic aspects of this important subject.

With reference to iodine, I may say that there are two types of deficiency, the absolute deficiency that is so much spoken about by Marine and Kimball, and the relative deficiency. In absolute deficiency we find a condition where the individual does not have a sufficient iodine intake, as you find in the upper middle West, Illinois, Wisconsin, Minnesota, and the like, or as you find in Switzerland or in the Himalaya mountains in Central Asia.

The other type depends upon the fact that the individual is subjected to a physiological strain which requires more work on the part of the thyroid.

In relative deficiency the organism requires more iodine, and this deficiency, this relative type of deficiency, when the body is under greater strain, is found in fetal development, in adolescence, in pregnancy, in lactation, and during the menopause, or at the beginning of the menopause. During those conditions more iodine is required and the ordinary amount of iodine may not be enough to allow the thyroid to work to its normal capacity. These are the physiological stresses and strains. On the other hand there are pathological stresses and strains which stretch the capacity of the thyroid. There are two that I think of at this moment. One is infection. Infection will induce a relative iodine deficiency. In America, in some quarters, infection has begun to be treated again by iodine in such conditions. The other type of relative deficiency is due to malnutrition.

We have two pathological types. Under such conditions iodine alone, as Dr. Jackson has shown, cannot remove a growth or an enlargement of the thyroid which already exists. You must see the problem not merely as an absolute deficiency but as a relative de-

iciency, and you must remove the underlying pathological strain. If a child has a chronic infection of a more general type or if a child is suffering from malnutrition, it is important not only to give iodine to remove the absolute deficiency, but also to do everything else to bring the individual up to normal.

With reference to iodine we may also say that iodine is better in the prevention of any type of goiter than in the curing of a goiter which already exists. If you have a simple goiter that is very large or if you have a simple goiter with areas of degeneration, there is a fibrosis, there is a calcification, and it stands to reason that iodine would be of no avail.

Then, again, we have the story of iodine medication. I am very much interested in the dose required. As far as I can tell the daily requirement is four one-hundredths of a milligram or one twenty-fifth of a milligram. I have been interested in finding out the dosage given by physicians. If we take five or ten grains of sodium or potassium iodide, we find that we give in a day enough iodine for the young or for the adult to last that individual forty-seven and one-half years. The amount of iodine required is four-hundredths of a milli-

gram, which would mean about fifteen to twenty milligrams per year.

Or, if we multiply the figure by two or three it would mean at the utmost that we give forty-five to fifty milligrams as the maximum physiological value. Iodine in physiological amounts has never done any harm, even in exophthalmic goiter. It surely has helped in the other types of goiter. The trouble lies in the fact that these massive doses from our standpoint of physiology are far too large for the individual to handle and the large doses have accounted, perhaps, for the increase in hyperthyroidism which we see when we give this iodine indiscriminately with reference to amount.

DR. ARNOLD JACKSON: There occurs to me one other indication that I failed to mention in which physical therapy is of great value and that is in the post-operative speeding up of the convalescence in these patients with ultraviolet light, viosterol and cod liver oil. I think Dr. Kern mentioned the use of calcium and ultraviolet light in building up these persons, and it is of great help to those who are doing surgery to build up these patients likewise after operation. I neglected to say that we are routinely doing this and seeing very remarkable results.

AFTER TREATMENT OF TARSAL AND METATARSAL FRACTURES*

JOHN D. ELLIS, M.D.

CHICAGO, ILLINOIS

The enactment of legislation providing for payment of indemnity for temporary disability and for the permanent loss of function of parts after injuries sustained by workmen in the course of their employment, has, like any other social reform, been productive of both good and bad results.

I believe the greatest benefit the surgeon has derived from this type of legislation has been the stimulation to view the treatment of injuries from a new standpoint—the standpoint of functional end-results. The adoption of this new viewpoint has focused his attention on those physical means which hasten the recovery of the injured and make the return to remunerative occupation assured.

The onus of complete supervision of the patient until a functional result has been obtained,

has been the cause of his renewed interest in physical and occupational therapy. The general surgeon and the orthopedist have had to overhaul their armamentaria and revise and improve their facilities for the treatment of trauma. In recent years the industrial surgeon has paid greater attention to the value of physical measures in the treatment of injuries and in the promotion of return of function.

In the surgical clinic for the undergraduate students of my pre-war medical days, I can remember how fractures of the tarsals and metatarsals were manipulated under anesthesia into an anatomically satisfactory position. Rigid casts were then applied and the student's attention was called to the skill of the operator in the treatment of fractures of the foot. We were assured that an excellent surgical job had been done and that this constituted a satisfactory treatment of fractures of the foot. The fact

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that these cases almost always had some permanent loss of function of the foot and often an ankylosis or a high degree of stiffness of the ankle, preventing the man from returning to an occupation requiring walking or long hours of standing, did not occur to us. Now we know that most of the fractures of the *os calcis* and a great many of the other tarsal fractures treated by the old method result in a permanently painful and partially disabling condition.

The greatest basic contribution of war surgery to the treatment of fractures of the appendicular skeleton was the establishment of the principle of extension in splints which at the same time permitted maintenance of some joint function treatment, as against the old principles of reduction by manipulation and maintenance of reduction by rigid casts until bony union occurred, with absolute disregard for what might occur in nearby joints during this process.

In treatment of fractures of the tarsus and metatarsus we have two principal indications of importance: First, preservation of function of the joints of the foot; second, immobilization to allow bony union of the fractures, with the preservation of the normal concave arches of the foot. All foot fractures are to be regarded as joint fractures, as the close proximity of the joints to even those fractures which do not primarily enter a joint, makes the treatment of attendant joint condition as important as the fracture itself.

A few points should be mentioned concerning the etiology of fractures of the foot and its bearing on their management: Most of these are compression fractures, the bones being squeezed together by the impingement of the adjacent bones. The scaphoid is in a keystone position and is thus often fractured by compression when the patient falls, landing forcibly on his feet. The *os calcis* when fractured by the common mechanism of falls on the heel is almost always comminuted and fractured through the neck, the tuberosity being forced upward. The metatarsals are more likely to be injured by direct violence to the foot, often by objects falling on the dorsum of the foot.

Before considering the application of traction to foot fractures, we may well mention the indications for *manipulation before the application of traction*. Manipulation to correct plantar angulation in the tarsals and metatarsals is often imperative and should be accomplished with the least possible amount of violence and under anesthesia. Uncorrected plantar angulation causes intractable metatarsalgia. This is one of the most distressing symptoms one has to face in a poorly treated foot fracture. The common fracture of the *os calcis* generally needs forcible overcorrection by powerful manipulation. Some operators routinely sever the Achilles tendon in these cases but I have not found it necessary to do this. Once plantar angulation in foot fractures is corrected and *os calcis* fractures are overcorrected this position can be maintained by a splint which I shall describe later.

The Application of Traction

The next consideration after the reduction of the deformity is the application of traction and this is feasible in most tarsal and metatarsal fractures. Almost the only exceptions to this consideration are avulsion fractures of the upper tuberosity of the *os calcis* and avulsion fractures of the base of the fifth metatarsal, produced by the unbalanced contraction of the perineus brevis muscle. Two results can be obtained by traction in these fractures:

1. Reduction of the deformity.

In the fracture of metacarpals, longitudinal traction can be exerted powerful enough to overbalance the muscular and ligamentous pull, which causes angulation or overriding. The same type of traction automatically reduces fractures of the metatarsals. Long continued traction on the toes breaks down the plastic tone of the muscles attached to the fractured bones, and results in a reduction of the deformity caused by the fracturing force.

2. Maintenance of reduction after manipulation.

Traction on the *os calcis* exerted on the long axis of the bones of the leg prevents the recurrence of the typical deformity of this bone after

this has been reduced by manipulation and over-correction secured. Traction on the fore part of the foot helps to prevent the recurrence of deformity in a compression fracture of the scaphoid and adjacent bones.

Effectual immobilization must be secured in a position to preserve and even exaggerate the concavity of the foot in slight supination so as to preserve both the longitudinal and transverse arches of the foot. It seems to me that the time has come to discard circular plaster casts for this purpose; by the use of proper splints it is possible to secure such immobilization and at the same time maintain extension upon the metatarsals, thereby assuring alignment of their shafts. The most useful splint for purposes of traction and maintaining concavity of the foot, thus meeting the two indications for treatment in immobilization, seems to me to be that developed by Dr. George G. Davis of Chicago for handling a series of crushing fractures of the foot occurring in the steel industry.

This splint is made of a curvel board $\frac{3}{4}$ inch in thickness. This is curved upward to maintain the plantar concavity of the foot while the anterior end of the board is sawed into five divisions to which the toes can be strapped with adhesive. The ball of the foot is strapped to the curved splint, after which the splint is forced sharply forward, exerting traction on the anterior part of the astragalus and all bones anterior to this. The curve of the board exerts a powerful pressure on the metatarsals just proximal to their necks, and maintains the normal long arch of the foot. The joint capsules are stretched to their greatest capacity by the traction exerted on the toes and transmitted through the long axis of the metatarsals. The splint is then firmly bound in this position by wide adhesive strips passed around the posterior end and across the ankle joint in front.

This extension prevents joint stiffness and ankylosis by preventing contracture of the tendons, ligaments and muscles, as well as the joint capsules during the period of immobilization.

Atrophic types of reactions of bones after injury have been described by Koehler, Keinbock, Preiser, Dwight and Kummel, which can

result from the continuance of the pressure by muscle and ligament contraction after compression fractures of the short bones. These pressure effects are prevented by extension, and further damage to the blood supply of the injured bones from continued pressure is thus overcome.

3. The third important indication in the treatment of these fractures after extension is instituted in the early inauguration of treatment of the joint and soft parts. Too much rest or absence of function results in degenerative changes. In a fracture extending into a joint, the capsule is injured and some hemarthrosis develops. Slight unrecognized hemarthrosis complicating apparently simple sprains of many of the joints of the extremities results in intra-articular adhesions, causing painful and limited motion out of all proportion to the severity of the sprain. Daily, passive motion and gentle massage stimulates the re-absorption of joint exudates. Timbrell Fischer has shown that fluid and dyes injected into joints are not re-absorbed from the joints if the part is immobilized, whereas if even slight motion is allowed, re-absorption occurs. The application of a splint, like the one described above, does not prevent the utilization of slight passive motion, gentle massage of the foot and almost complete passive motion of the ankle joint. These motions and massage should begin the first day after the splint is applied.

4. *Removal of splint.* The general rule for the maintenance of splinting and extension of the foot is four weeks, with a further period of two to four weeks before weight is borne on the foot. The patient should not be directed, after the removal of the splint, to use the foot. Often after the splint is removed the foot which has been dependent swells at the end of the day. The customary old slipper is worn by the patient, and the absent support of a stiff-soled shoe is a handicap which results in further relaxation of the muscles and ligaments of the foot. A painful foot and metatarsalgia develops. As soon as weight-bearing is allowed the patient should wear a properly fitted shoe with both arches supported by felt pads beveled to fit.

After splint removal, heat, massage and exercises and the use of sinusoidal current are

indicated to aid in restoration of the blood and lymphatic circulation, and to strengthen the ligaments and muscles. Diathermy is of little use in supplying heat to the foot and may produce a burn on a foot that frequently suffers from lessened sensation and oedema. Generally a dry heat-baker answers the indication for heat. Deep massage is now needed, and resistive exercises should be alternated with massage. The prevention of post traumatic flat-foot contemplates the restoration of the function of the stretched inverters with relaxation of the contracted everters and is best accomplished by resistive motion directed toward resisting the action of the inverters and thus strengthening them. Considerable harm is done by allowing uncontrolled exercises for the first two weeks.

We routinely give the patient a printed set of foot exercises to be followed without weight-bearing on the foot for the first two to four weeks, depending on the fracture and consisting of toe flexion exercises and exercises for the perineal muscles, ankle movements, etc. We supply them with another set of directions for exercises after weight-bearing is allowed, consisting of instructions for walking with the toes turned inward and the feet supinated. Also for walking on an inverted trough to promote supination. Many of these cases in addition need to encourage supination of the foot by wearing a "Dutchman" inserted in the inner edge of the sole and heel.

SUMMARY

1. Treatment of the soft parts requires as much care in fractures of the feet as do the fractured bones.
2. Most fractures of the bones of the feet can be reduced by extension with little or no manipulation.
3. Extension can be secured on splints which leave the foot partially exposed, allowing physical therapy to be started immediately after the injury. Plaster casts do not allow this.
4. The protection of the foot after the splint is removed is an important consideration in preventing post-traumatic disability of the foot.

5. Combined surgical and physical treatment is necessary in handling foot injuries.

DISCUSSION

DR. JOHN HUNTER (Ontario, Canada): I have now a lady patient, a doctor between 60 or 70 years of age, who stepped into a hole and fractured either the lower end of the *os calcis*, or a part of the scaphoid—I don't know which. She was treated for months by an eminent surgeon in Toronto, and then referred to the Mayo Clinic where she spent a year and a half.

She was referred from there to California for heliotherapy. In California she came under the hypnotism of Aimee McPherson who she claimed did more for her than all the rest. She came back to Toronto, and now she has a stiff ankle with a discharge of pus and blood from one or more sinuses. I told her after all the treatment she had gone through, the only thing I would attempt to do, was to re-establish, so far as possible, metabolism. I gave her strict directions as to diet and heliotherapy and gave her diathermy by placing an electrode about four inches wide by about sixteen inches long, along the spine, and an electrode about an inch wide and sufficiently long to encircle the anterior portion of the foot. I passed diathermy through in that manner. She claims now that she is walking very much better, is free from pain, is sleeping better, and certainly is looking better. The edema of the foot is disappearing. But I should like to ask Dr. Ellis why the discharge keeps up just the same. She has had a score of laboratory examinations made, tests of the blood, kidneys and everything else. I should like the doctor to kindly explain to me why that discharge keeps up.

CHAIRMAN WALKER: Injuries of the feet are very common. We know that individuals with injuries of the foot will limp for a long time and, as we say, favor the foot for a long time.

DR. A. D. WILLMOTH (Louisville, Ky.): I think that injuries about the joints and particularly the lower extremities are of interest to every surgeon and physician. The laboring class of people, perhaps, can get along very well with rather a stiff hand; but the ordinary day laborer who has to get about, if you lame him in his lower extremities you have decreased his earning capacity very much.

I was interested in the report of this case and particularly the question asked by Dr. Hunter as to the cause of the discharge at the ankle. I would say that the first thing that this particular case needed was x-raying of the foot, a lateral picture and an antero-posterior (the lateral will give you more information, perhaps) to see how much dead bone there was present.

DR. HUNTER: That was done perhaps a dozen times. I have not seen the plate but she reported it was done at the Mayo Clinic.

DR. WILLMOTH: The chances are that there is dead bone in this foot that will have to be cleaned out before it will heal. One thing I would suggest is the zinc

ionization of these tracts with the galvanic current; another suggestion would be the injection into the sinuses of some photosensitizing agent, such as the carbolfuchsin, or gentian violet, and then the introduction into the mouth of the sinus of an olive tipped quartz applicator which is attached to the water-cooled lamp. Perhaps in that way you can get the ultraviolet rays deep into the tissues and cause the sinus to heal. I should try those two things.

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PHYSICAL THERAPY CLINICS

TREATMENT OF FACIAL PARALYSIS*

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Owing to its peculiar course and relationships, disease or injury to the seventh nerve is of rather common occurrence. Any procedure that will afford encouragement is indeed welcome. The emotional state of the patient is of prime importance. Inability to move the muscles of the face, especially if the orbicularis palpebrarum is involved, induces an exaggerated estimate of the pathology, and an apprehension of a calamitous outcome. It is futile to attempt to assure the patient of a favorable prognosis and probably a speedy recovery, unless recourse is had to a method that is prompt, active and effective. In unilateral facial paralysis, recovery is the rule within one to four months, but this period can be reduced to two or three weeks, and at the same time the emotional apprehension can be alleviated in a day or two. My

experience has been that women exhibit a greater panic than men, and are abnormally apprehensive that the asymmetry will be permanent. At the same time, they cooperate more fully when they realize that the treatment is accomplishing the desired results.

Consider the anatomical relationships of the seventh nerve, and lay a foundation for a survey of the etiology and essential elements of the prognosis. The facial nerve arises from the lateral tract of the medulla oblongata, in the groove between the olivary and restiform bodies. Its deep origin may be traced to the floor of the fourth ventricle. The nerve passes forwards and outwards upon the crus cerebri and enters the internal auditory meatus. At the bottom of the meatus, it enters the aqueductus Fallopii and follows the serpentine course of that canal through the petrous portion of the temporal

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bone, and emerges at the stylo-mastoid foramen. In the Fallopian canal it receives and gives off numerous filaments, forms intimate relationship with neighboring nerves and enters into the composition of Meckels ganglion and the Otic ganglion. At the stylo-mastoid foramen, the nerve is surrounded by lymphoid structures, and in its passage forward, it traverses the substance of the parotid gland. About a quarter of an inch above the stylo-mastoid foramen, the chorda tympani is given off. It ascends in a distinct canal parallel to the aqueduct and traverses the cavity of the tympanum, to emerge through a foramen at the inner side of the Glasserian fissure.

Thus, we see, that throughout its course, it is both securely housed and hazardously exposed. Housed in its bony canal, and jeopardized by its very protection, for it will be readily perceived that any inflammatory swelling, hemorrhage or lymphatic engorgement, would produce an immediate pressure on the nerve that would obliterate its function. Fortunately these conditions are usually transitory, and the function of the nerve is speedily restored; but when they persist for a sufficient time to produce degenerative changes in the nerve, the paralysis is either long standing or permanent.

In addition to the hazards above enumerated, many other etiological factors have been advanced. A central lesion, whether hemorrhagic, inflammatory or neoplastic, may cause a complete loss of expressional movements of the face, and is usually permanent, and occasionally bilateral. Inflammation of the tympanic cavity may extend sufficiently to invade the nerve, and Teik advocates that a routine examination should be made for an otitis media or mastoiditis, especially in the first two decades. Neumann lays stress upon the large number of lymphatics and lymphatic glands encircling the nerve at its exit from the stylo-mastoid foramen, so that a fulminating pharyngitis or a cervical adenitis may induce a stagnation of lymph, or transmit a frank inflammatory process to the emerging nerve and thus choke it off in its unyielding canal.

But by far the largest number of cases of facial paralysis are the result of exposure to cold

or to a draft of air upon the side of the neck. This is the so-called rheumatic type, or Bell's palsy. It is in this type that the most brilliant results are obtainable, and a usual six weeks duration has been cut to two. And not only that, but the patient realizes a distinct improvement in his condition within two or three days. His confidence is gained and his direful forebodings are forgotten. His nervous equilibrium is re-established, and he is amenable to all suggestions as to his own part in restoring conditions to normal. His facial gymnastics assume their proper importance, and active co-operation comes as a matter of course.

A diagnosis of facial paralysis is obvious. There is no sensory symptoms with the possible exception of a slight numbness. At rest, the affected side shows a lack of expression—rather a mask-like appearance. All voluntary movements are impossible on the affected side, and the face is pulled toward the sound side. The angle of the mouth is elevated by the zygomatici, and all efforts to whistle, smile, grin, frown, or to close the eyes, are futile, producing a ludicrous distortion of the face. The platysma is invariably involved, and the occipitofrontalis usually so. Inability to close the eyes is one of the most distressing symptoms, and may evenuate in a keratosis from a lack of control of the tears, which escape over the drooping lower eyelid and run down the cheek. If the lesion is near the stylo-mastoid foramen, the chorda tympani may be involved, and there is a resulting diminution of salivary secretion. Where the lesion is higher up in the canal, the tympanic branch may be involved, and hearing may be accentuated due to the unopposed action of the tensor tympani. When due to middle ear disease, and in disease at the base of the brain, involving both facial and auditory nerves, hearing is lessened. In the latter case, bone conduction will be either diminished or lost.

Thus it will be seen that there is more involved than a mere diagnosis of facial paralysis. The location of the lesion may be determined by examination of the muscle groups involved, and a prognosis determined with a high degree of accuracy.

In treating this condition I first reassure the patient and allay his fears. A calm talk with him as the examination progresses does much to inspire hope and enlist his cooperation. A surface electrode, connected to the Oudin or unipolar current, is applied to the affected side of the neck, and by my fingers, I draw the current toward the various muscle groups, preserving their tone and nourishment, and maintaining the continuity of nerve conduction in preparation for the later sinusoidal current. The electrode is changed to the sound side, and to both cheeks, and by careful manipulation the entire affected side is heated up. A gentle massage is then given the face, with special attention to the paralyzed muscles. The patient is then advised to rest as quietly as possible, making no effort to try out or exercise the muscles of the face, and to return for treatment the following day. On the second treatment the same course is followed, and at this time or at the third treatment a gentle stimulation with sinusoidal current is instituted, care being taken that the current is not strong and that the paralyzed muscles are not over-worked. This line of treatment is pursued throughout the period of disability, and gradually intensified especially as to massage and sinusoidal, until complete function is restored. As a return of function is established, the patient is instructed to institute voluntary motion of all the facial muscles on the affected side, but to stop short of fatigue.

I have treated many patients by this method, but lack of time precludes more than a few case histories to illustrate.

Case I. Female, school teacher, gave history of attending a dance, to and from which she rode in an open auto. Two days later, she noted numbness in right side of face and sluggish muscular action. By evening, the entire right face was paralyzed, and she came to me for treatment. As she was very nervous over her condition, and was especially anxious to return to her school, she was given two treatments daily of slightly shorter duration, however. By the second day, voluntary motion was perceptible, and in less than two weeks there was perfect return of function of the entire face.

Case II. Greek school boy, gave indefinite history of repeated colds and sore throat. Was referred to me for treatment on day that paralysis developed. There was complete immobility of all muscles of the left side of the face. The routine treatment was instituted, with the addition of sterilization of the tonsils in accordance with the method reported by the writer before this body at its last session. Voluntary motion was perceptible on the fourth day. There was a lack of cooperation on the part of this patient, and progress was delayed. However, after three weeks there was practically complete restoration of function of all muscles.

Case III. Negro male about sixty years of age. Because of extremely poor articulation, no adequate history was obtainable. All muscles of both sides of the face were paralyzed, but there was slight function in occipito-frontalis. He was put on routine treatment for a month without any perceptible benefit. In the meantime, a Wasserman was taken, and the return was 4 plus. He was sent home as incurable, and died within a month, the diagnosis being cerebrospinal syphilis.

SUMMARY

1. The operator should have confidence in his method of treatment.
2. The fears of the patient should be allayed as much as possible.
3. The first one or two treatments should consist of only a thorough warming of the parts.
4. Sinusoidal should be instituted very gradually, at first a bare stimulation, and as function returns, increasing to good contraction.
5. Facial gymnastics should be urged upon the patient when function begins to return, and the tonsils should be cleaned up, if they are suspected of being a focus of infection.
6. A favorable outcome may be expected in two weeks, and perceptible improvement in two or three days.
7. Central lesions are, of course, not amenable to treatment by this method.

DISCUSSION

Dr. J. U. GIESEY: Mr. Chairman, I am sure Dr. Cahall's review of the origin and course of the seventh nerve should be at least refreshing to all of us. I think many of us probably forget the anatomical distribution of the cranial nerves, unless called upon to follow them persistently and frequently. The bearing of that on the location of the lesion is of definite value in the evaluation of these cases.

The use of the Oudin current, with the digitalization of that current through the affected muscle tracts, is certainly a definite means of gaining a certain nerve and tissue stimulation. I cannot criticize it, because the results speak for themselves. I can only give a modified technic that I have been using with equally good results.

I have been using a preliminary diathermic current until the entire muscle involved is heated and circulation stimulated. Then, following that, I have been using the direct current over the affected zone, using a positive as close as possible to the side of the lesion for the facial constrictor and visual shrinking effect, a

labile negative pole for its stimulating effect on the nerve trunk, and then following that with a very smooth slow sine for its stimulating quality.

As a case in point: A girl was knocked down by an automobile which was driven through a safety zone. She sustained a fracture. That was a case of absolute trauma. The results were problematical, and yet, by a consistent following out of the technic cited, a muscle test for nerve regeneration proved we could get some response. After two months' treatment, the girl had almost complete return of the nerve function and there was no apparent paralysis except under emotional stress.

Another very interesting case was a boy who had two upper molars extracted under local anesthetic. Six hours later he developed a complete right sided facial paralysis. Our result in that case was good and his recovery very rapid.

I was very glad to hear the essayist stress the psychic management of these cases, because the psychic element is very large and a positive optimistic attitude on the part of the physician will do a great deal to help gain the cooperation of the patient.

EDITORIAL

ARCHIVES OF PHYSICAL THERAPY

1930 Annual Meeting in St. Louis

BACHEM-KOBAK PHYSICAL THERAPY CHARTS

The physical therapy charts prepared by Albert Bachem, Ph.D., of the University of Illinois College of Medicine, and Disraeli Kobak, M.D., Rush Medical College, present all that is reliable regarding the use of physical therapy in medicine.

These charts necessarily are in outline form but cover the history of various agents, the physical characteristics, biological effects, physiological effects and therapeutic indications. They cover all forms of light, electricity, high frequency currents, x-ray and radium.

These charts are especially valuable for teachers of physical therapy but are also valu-

able for hospitals and doctors' offices where they can be used for frequent reference, thus enabling those working in the various departments to have a better understanding of the principles underlying the use of physical agents in medicine.

These charts are designed for study of details and principles; demonstration of physical therapy to specialists, general practitioners, technicians, nurses; teaching to students, nurses, technicians, practical application as to indications, contra-indications, treatment methods, dosage, etc.

The charts, six in number, are about 30 by 40 inches in size and cover the entire range of physical therapy from biophysical foundations to the therapeutic application.

These charts may be obtained from E. Bachem, 1337 Winona Street, Chicago, publisher, or through any of the dealers in physical therapy supplies.

ANNOUNCEMENT

The University of Michigan Medical School is offering a course designed to provide a complete training for technical assistants or technicians in physical therapy.

Applicants to be accepted must have a certificate from a recognized school of nursing or a degree from a recognized school of physical education.

Instruction will begin with the opening of the 1930 summer session. The work in the summer school will be devoted to instruction in anatomy. This will consist of dissection and quizzes, special emphasis being placed on the study of the extremities. Following the close of the summer session there will be a two weeks vacation period.

Instruction will be resumed on the first of September, this period before the opening of the regular school year being devoted to the study of massage and muscle education.

During the regular university session the subjects of histology, physiology, applied anatomy and physics will be taught at the same time that the theory and practice in actinotherapy, electrotherapy, thermotherapy, hydrotherapy, massage and muscle education are given. The course will close with the completion of the school year in June, 1931.

The university hospital provides a large amount of material for teaching purposes so that the student will have an excellent opportunity to carry out the practical work in the department of physical therapy.

Following the successful completion of this course a certificate will be granted by the University of Michigan Medical School.

The tuition is as follows:

Matriculation fee for resident students, \$10.

Matriculation fee for non-resident students, \$25.

Annual fee for school year, \$113.

Summer session, \$33.

Applications should be sent to Willis S. Peck, M.D., University Hospital, Ann Arbor, Mich.

RULES FOR THE LIEGE CONGRESS

The Fifth International Congress of Physiotherapy will meet at Liege from the 14th to the 18th of September, 1930.

It shall include full members and associate members.

Full members shall be doctors in medicine and science. Associate members shall be delegates from thermal, bath, and climacteric establishments and from institutes for physical therapy, as well as manufacturers of physiotherapy apparatus. The organizing committee reserves the right of accepting or refusing any proposed candidate. Wives of members may be entered as associates. Medical and science students are invited to attend the sessions.

The fee is 150 Belgian francs for full members and 75 for associate members.

An individual card signed by the general secretary will identify members of the congress. Only full members will have the right of taking part in discussion and of reading papers. Associate members will be invited to banquets and receptions and may attend the sessions. The management assumes the right to accord the floor to associate members.

In each section a given number of topics will be presented. All papers should be related to these topics. There will be five sections: 1. Kinesitherapy, including physical education; 2. Radiology (roentgenotherapy and curietherapy); 3. Hydrology, climatology, and thermotherapy; 4. Electrolgy; 5. Actinology.

Official reports and papers must be sent for printing to the general secretary not later than June 1, 1930.

Official reports must not exceed sixteen pages, papers eight pages. They will be distributed before the opening of the congress. Pages above the fixed number will be omitted unless the author has pledged himself to pay the excess cost.

Unless permitted by the presiding officer no speaker may occupy more than ten minutes to present a report nor more than five minutes for a paper. No one may speak more than twice in the same discussion. Readers will always have a right to close discussion. The presiding officer will have the right of stopping a discussion which lasts beyond half an hour. Members who participate in discussion shall lodge with the general secretary the next day an outline of the remarks made, in default of which a simple mention will appear in the minutes.

Every member of the congress may speak in his native language, but speakers are asked to use a language understood by the majority of those present. The printed matter, pertaining to the congress will be issued in French, English, Italian, and German; the reports and proceedings will be published by the organizing committee and sent to all full members.

The bureau will determine the order of the day and will decide all questions not provided for in these rules.

At its last session the congress will decide, on recommendation of the Permanent International Committee, the place and date of the next congress.

Foreign Committees

In each country the committee on the congress has delegated its organizing function as far as possible to an outstanding physiotherapist, usually to a member of the committee of a former congress (Liege 1905, Rome 1901, Paris 1910, Berlin 1912).

The members of these foreign committees are requested:

(1) to stimulate propaganda in their respective countries in scientific and professional associations and among their friends;

(2) to publish notices in the press;

(3) to supply us with reports and papers which may be rendered by specialists in their countries;

(4) to remit thirty belgas to checking account No. 243065, Physiotherapy Congress, Dr. de Keyser, Bussels.

Announcement

The above rules of the congress have been translated for the convenience of those not familiar with the language, that they may understand the full plan of the arrangements for the congress.

Applications for membership in the congress, with the membership dues, which at the present value of the Belgian franc (14 cents) is \$5.00 including the exchange, may be forwarded to either the American president of the congress or directly to the general secretary of the congress.

Sailings have been reserved for fifty members who might attend the congress. If early notice is sent to Dr. William Benham Snow, 1650 Broadway, New York City, arrangements will be made for the sailings and plans for the itinerary forwarded. Itineraries are arranged for a short trip or to include a trip to Rome or a trip to Oberammergau.

WILLIAM BENHAM SNOW, M.D.,

President, American Section of Congress.

TITLES FOR PAPERS FOR FIFTH INTERNATIONAL CONGRESS OF PHYSICAL THERAPY AT LIEGE

1. The Surgical Indications for Desiccation and Coagulation (Lantern Demonstration). By William L. Clark, M.D., Philadelphia, Pa.

2. The Evaluation of Electro-Surgery in Neoplastic Diseases (Illustrated). By George W. Wyeth, M.D., New York City.

3. Electro-Surgery in the Treatment of Surface Neoplasms. By William D. McFee, M.D., Haverhill, Mass.

4. Gastro-Intestinal Stasis. By Henry A. Cotton, M.D., Trenton, N. J.

5. The Incompetent Cecum and Its Relation to Focal Infection. By George J. Ott, M.D., Boston, Mass.

6. The Evaluation of Static Electricity in the Treatment of Inflammation. By William Benham Snow, M.D., New York City.

7. Electrotherapeutic Treatment of Pelvic Diseases. By M. W. Knapp, M.D., San Jose, Calif.

8. The Treatment of the Cervix Uteri by Physical Therapy as a Prophylaxis of Cancer. By Arthur L. Brown, M.D., Winchester, Mass.

9. The Biological Action of Radiant Energy. 1. Ultraviolet. By Eugene R. Whitmore, M.D., Dr.P.H., F.A.C.P., Professor of Parasitology and Pathology, Georgetown University, Washington, D. C.

10. Electro-Biophysics: Electrotherapeutically Conceptive and Perceptive. By Joseph E. G. Waddington, M.D., Detroit, Mich.

11. Physical Therapy in Cardiovascular Diseases. By Mary L. H. Arnold Snow, M.D., New York City.

12. Fractional Dose Method in Roentgenotherapy. By William Benham Snow, M.D., New York City.

13. The Physical Treatment of the Effects of Septic Dissemination from the Cecum. By Frederick H. Morse, M.D., Boston, Mass.

14. Emma Dawson Parsons, M.D., Waterloo, Iowa. No title yet given.

15. Frank S. Meade, M.D., Madison, Wis. No title yet given.

16. H. G. Wahlig, M.D., Sea Cliff, N. Y. No title yet given.

17. George E. Deering, M.D., Worcester, Mass. No title yet given.

18. A. Bern Hirsh, M.D., New York City. No title yet given.

SUBSTITUTE-SUNSHINE FOR MINERS

Seven years ago there was installed in the hospital of the Bunker Hill & Sullivan Mining Company at Kellogg, Idaho, an ultraviolet ray quartz lamp, found everywhere in the offices of physicians and among usual hospital equipment. The use was confined largely to treatment of pathological cases, still treatment of under-

nourished children, run-down anemic people, both men and women, and, as a general tonic, was part of the routine hospital procedure. At the latitude of the Coeur d'Alene district, and especially because of the position of the towns in deep canyons, with much overcast and cloudy weather, sunshine is not plentiful at any time of the year; for many of the winter months there is scarcely any. Underground workers, particularly during the winter, have little sunshine; it is not unusual to have none at all for weeks at a time.

Treatment by the ultraviolet ray lamp in the hospital has resulted in many extraordinary benefits, but the use of the lamp is expensive and limited.

Real interest was also displayed by employees with the possibility of securing ultraviolet ray treatment for themselves and families under better conditions than it was possible to have by the limited use of the lamp at the hospital. This resulted in the installation of the so-called sun-room or automatic solarium as an adjunct to the mine change-house. An annex was built with dressing rooms for women, children, and men from other departments, and the outfit put into use on September 5, 1929. The installation consists of a narrow moving platform, passing through a cabinet equipped with six ultraviolet ray lamps. After taking their shower, and before dressing, the men step on the moving platform and ride through the cabinet. One minute is required and three treatments per week are recommended; the outfit can readily treat four hundred individuals per hour.

Use of the so-called sun-room is wholly voluntary. The number of people applying for treatment is growing, and with winter weather will probably increase even more rapidly. At the present time over two hundred men per day are treated, and between fifty and sixty women and children. It is too early to describe individual cases where real benefits have been secured, but because of the experience with the small quartz lamp at the hospital during the last seven years there can be no doubt as to the excellent results which can be confidently expected. It is predicted and believed that with the gen-

eral use of the apparatus lost time, because of colds and other respiratory ailments, will be reduced at least one-half.

The ultraviolet ray or artificial sunshine treatments provided by this installation are primarily to supply the deficiency of natural sunshine which is seasonal at this latitude, and which can not be regularly experienced by underground and other workers in the local industries because of climatic and winter conditions.

Wide experience, extending many years indicates the beneficial results of such treatments, not only to the general health, but even in pathological cases; still the treatments can not take the place of proper medical or surgical attention. The treatments are primarily a constitutional tonic to fortify the system against infection and disease. In order to secure the best results they must be taken with regularity. At the outset exposure to the ultraviolet rays should be taken frequently for periods of short duration. A treatment every other day, of one-minute duration, should suffice for men and women patients, and forty-five seconds for children.

The cooperation of employees and others who avail themselves of the treatments provided by the solarium is asked in order that all may receive proper and sufficient attention. At no time must individuals enter the solarium or attempt to use it without the authorized attendant being present. This rule will be strictly enforced. Individuals presenting themselves for treatment must do so at the time assigned them, and at no other.—Stanley A. Easton, Kellogg, Idaho, in *Mining and Metallurgy* (New York).

REVISION OF INTERNATIONAL LIST

At the fourth decennial conference for the Revision of the Classification of the Causes of Death, held in Paris in October, important changes were made in the classification of death from cancer, according to the Statistical Bulletin of the Metropolitan Life Insurance Company.

According to the Bulletin, new rubriques were added to provide for separate tabulation of cancers of the respiratory system and the male genital organs. Cancers of the pharynx will henceforth be classified along with those of the buccal cavity, instead of being associated with growths in the esophagus, stomach, liver and gall bladder, as formerly. Cancers of the duodenum will be studied along with those of the stomach, liver and biliar passages.

PHILATELY AND CANCER

Philately is the latest recruit to the cause of cancer control. Within the past two years Sweden and Denmark have issued semipostal stamps which are sold at a premium to support the governmental anticancer work in those countries.

In June, 1928, Sweden issued a series of semipostals to commemorate the seventieth birthday of King Gustav V. The set bears a portrait of the King and is issued in denominations of 5, 10, 15, 20 and 25 ore, each of which is sold at a premium of 5 ore. The funds received from this surcharge are devoted to anticancer work.

On this occasion also a fund of \$1,500,000 was presented to the King as a thank offering and tribute to his statesmanship; which His Majesty accepted with the provision that it be used in the campaign against cancer in Sweden.

Denmark has more recently issued a series of semipostals in the values of 10, 15 and 25 ore, which are sold at 15, 20 and 30 ore, respectively, the extra 5 ore going to the Danish Cancer Committee.

Many governments throughout the world issue postage stamps, which, in addition to the actual prepayment of postage, carry a surcharge to raise funds for some charitable or other humanitarian purpose.

Such objects have included relief for the poor, the care of the sick, the maintenance of war veterans, the building of memorials, the restoration of cathedrals, and the like.

The United States does not issue stamps of the semipostal variety.

RADIUM FACTORY AT PARIS

The Paris correspondent of the Journal of the American Medical Association announces in a recent letter that the city of Paris has granted to Madame Curie a plot of ground and 1,500,000 francs (\$60,000) for the installation of a factory to manufacture radium, and that the French government has allowed her a large subsidy for its operation.

The correspondent adds that the journey of Madame Curie to the United States was followed in France with a high degree of interest and every one was profoundly touched by the hearty welcome she received from President Hoover, the universities and the American press.

The gram of radium which Madame Curie received on her recent visit to this country was destined, not for France, but for Poland, the native country of the widow of the French physicist.

According to Dr. Claude Regaud, the present supply of radium at the Radium Institute at Paris totals 7,200 milligrams of which 1,000 milligrams is at the personal disposal of Madame Curie for her laboratory research work; 1,200 milligrams belonging to the Curie Foundation, 600 milligrams belonging to the Laboratory of Radiophysiology, and 4,400 milligrams being lent to the Curie Foundation for certain scientific researches.

ANTICANCER CENTER IN BOLOGNA

The following announcement was contributed in a recent edition of the Journal of the American Medical Association:

"On the initiative of Professor Viola, senator, medical clinician of the University of Bologna, an anticancer center has been established in Bologna, with departments of general surgery, gynecology, radium and roentgenotherapy."

\$25,000 RADIUM GIVEN MONTREAL HOSPITAL

Learning that a gift of \$100,000 from the Quebec provincial government for the purchase of radium for Montreal hospitals had been entirely expended on Canadian institutions, ten prominent citizens headed by Sir Herbert Holt, Sir Charles Gordon and E. W. Beatty, have presented Royal Victoria Hospital with 325 milligrams of the metal valued at \$25,000.

The gift was stimulated by a recent announcement from London of advances made in the cure of cancer by radium. . . . Washington (D. C.) Times.

ONTARIO DENTAL ASSOCIATION

The annual convention of the Ontario Dental Association will be held at the Royal York Hotel, Toronto, on May 19-22, 1930. A very fine program of essays and clinics has been prepared. Ethical dentists of provinces of Canada, outside of Ontario, and from the United States are invited to attend as guests of the Ontario society.

PHYSICAL METHODS IN RHEUMATISM

The suffering and national loss occasioned by the rheumatic group of diseases is ample justification for the prominence given to the current issue of the British Journal of Actinotherapy and Physiotherapy (January, 1930) (2/ net, 17, Featherstone Building, W.C. 1.). This issue forms the "Annual Rheumatism Number," and it is largely devoted to a consideration of the role of various physical agents in curing and alleviating rheumatic affections. Each subject is dealt with by a leading authority, and the issue as a whole forms a review of the possibilities that will be found of great interest by all who are concerned with treating any form of rheumatism.

An introductory paper by Dr. Turrell (Oxford) deprecates too minute concentration of classifying and differentiating various forms of

chronic rheumatism. He points out the two invariable factors in its causation, i. e., a poison of varying virulence and a lowered local or general resistance, and he explains in a practical way the role of electrical methods in the restoration of the patient. Dr. van Breemen (Amsterdam), a leading Continental authority, takes up the subject of the use of artificial light therapy in rheumatic conditions, and shows how this must form an integral part of any considered scheme of treatment. Both ultraviolet and infra-red irradiation are of value in different cases.

A review of the many important uses of balneotherapy is given by Dr. Kerr Pringle (Harrogate), and the subject of mud packs and

baths is considered by Dr. L. Schmidt, one of the leading physicians at the Bath of Pistany. The possibilities of radio-active waters and brine baths are also dealt with, and a practical illustrated memorandum of Dr. Cochrane Shanks describes the part played by radiology in diagnosis and control of rheumatic conditions.

A very interesting paper by Dr. Margarethe Mautner describes the very extensive use which is made of physical methods in dealing with the problem of industrial rheumatism in Germany. In a leading article the Journal calls attention to the serious lack of such facilities in Britain, and urges on the authorities and the friendly societies the adoption of a definite program to meet this deficiency.

THE STUDENT'S LIBRARY

BOOKS RECEIVED

This column is devoted to acknowledgment of the books received. Such acknowledgment must be regarded by the sender as sufficient recognition of the courtesy until time and space permit selections to be made for review.

SUNLIGHT TREATMENT. Third edition. A concise guide for the use of ultraviolet irradiation in actinotherapy. London, Eng.: Ajax, Ltd.

Eng.: William Heineman, Publishers.

COMMON COLDS—CAUSES AND PREVENTIVE MEASURES. By *Leonard Hill*, M.B., F.R.S., Hon.A.R.I.B.A., and *Mark Clement*. 126 pp. London,

THE PRINCIPLES OF ELECTROTHERAPY AND THEIR PRACTICAL APPLICATION. By *W. J. Turrell*, M.A.D.M., etc., Consulting Physician Oxford County and Mental Hosp., etc.; second edition. 400 pp. London, England: Humphrey Milford-Oxford University Press.

BOOKS REVIEWED

COMMON COLDS—CAUSES AND PREVENTIVE MEASURES. By *Leonard Hill*, M.B., F.R.S., Hon.A.R.I.B.A. Fellow University College, London, and *Mark Clement*. London: William Heineman (Medical Books) Ltd. 1929.

The subject of "colds" has been discussed and written upon until one wonders whether it is possible to stand on common ground. There are so many viewpoints, so many "cure-alls," and finally, too many specifics. The fact remains, that, in spite of the existing situation, the profession welcomes a rational treatise,

particularly one which deals with rational phases of the problem—causes and preventive measures.

This little volume contains in its six chapters some valuable practical information. In a sense much of it is new, yet isolated reports of the data may have been met heretofore by enthusiastic readers. The psychological aspect of "catching cold" is one briefly considered. It is an important consideration and one which merits more thought than it has been accorded in the past. That psychological reactions are frequently encountered is probably more true in this so-called "catch-

ing cold" complex than in many other ways. As the authors note: "The advocacy of rules of hygiene at variance with established habits may cause psychological reactions as irrational as some of our inherited beliefs. In considering new doctrines emotions may leap ahead of critical thoughts to save prejudices from the grip of reason. Conservative minds reject unfamiliar ideas to which they are not emotionally attuned and mere feelings determine decisions with little regard to impartial consideration."

The causes of common colds are considered at length. The chapter dealing with this phase of the subject represents a comprehensive review of etiological factors. Experimental data of the authors and of other workers is cited.

In the chapter on preventive measures are discussed diet, light, ventilation, clothing and exercise. These are practical considerations which are here dealt with in more detail than is found in textbooks. Under the heading, light, information is given regarding the skin and its relationship to the systemic action of ultraviolet rays. Other details regarding ultraviolet rays are also given. The noteworthy work of Colebrook, and Eidinow and Hill, on the effect of light on the bactericidal power of the blood, is recorded.

The final chapter is on treatment. Practically all the agents employed in the care of the common cold are briefly described.

While the subject as a whole could be discussed in other ways, the practical viewpoint assumed at the outset and retained throughout is unquestionably to the liking and understanding of the practitioner of medicine. After all, the specialist in upper respiratory infections too often forgets the numerous factors involved. He leans toward the local pathology and aims to cure by eliminating the focus. The external and intrinsic causes must be duly considered. Their relationships are more intimate than usually believed.

A REVIEW OF ARTIFICIAL LIGHT THERAPY.

In view of the many conflicting statements for and against the value of artificial light therapy, the pub-

lication of "A Review of Artificial Light Therapy" (Actinic Press, 17 Featherstone Buildings, London, W. C. 1:2/—net) is particularly timely. This booklet of 32 pages has been compiled by Dr. R. King Brown, from authoritative and official sources, with a view to demonstrating the proved value of light therapy in medical and surgical practice. Each statement made in the booklet is supported by one or more references to reports of medical officers and superintendents of sanatoria and hospitals, and to published papers in medical journals, conference proceedings, and text-books. By thus gathering together in one volume the views and experiences of large numbers of British and foreign observers whose views are entitled to respect, Dr. King Brown presents a fully-authenticated picture that amply justifies the words of Sir William Willcox, quoted in the introduction, that light therapy has "an important place in modern therapeutics."

Sections are devoted to Medical Diseases (Tubercular and Non-Tubercular), Surgical Diseases (Tubercular and Non-Tubercular), and Special Surgical Diseases. In each section the various complaints known to be benefited by light therapy are noted. It has obviously been Dr. King Brown's aim to make no statement that could not be supported by reference to an authoritative source, and this gives the booklet a very special importance. No unprejudiced reader can fail to be impressed by the closely-packed evidence which shows the value of light therapy in conditions which range from alopecia to pulmonary tuberculosis, and from hay fever to eclampsia.

A special chapter deals with the use of light therapy in prophylaxis of colds and rickets; another with its use in pregnancy and lactation. A brief but informative chapter deals with light biology and pathology, and another shows strikingly the financial saving over other methods of treatment which frequently follows the use of light.

The tedious tasks of search, selection and compression have produced in this booklet a miniature work of reference of great interest, which should be read by everyone anxious to be fully acquainted with the possibilities of light therapy.

INTERNATIONAL ABSTRACTS

The Local Application of Heat As An Adjunct in the Social and Individual Prophylaxis of Syphilis. J. F. Albert Bessemans, et al. Urol. & Cutan. Rev., 34:71-91, Febr., '30.

The authors believe that they have been the first to define certain limits within which heating alone is capable of destroying the *Treponema pallidum* in *vivo*.

They have formulated a working hypothesis upon the subject of the role of tissue temperature in the pathogeny of syphilitic infection in the rabbit and in man.

They have adduced some arguments in favor of the idea of a simple intervention of heat in the working of the so-called pyretotherapeutic methods in the treatment of syphilis.

Their hypothesis is given for what it is worth, but the facts upon which it stands merit, it seems, a most careful consideration. The problem of syphilis remains surrounded by so many problems, that the common effort of laboratory men and clinicians is needed in the attempt to solve it.

Infraclavicular Foci of Infiltration as Evidence of Incipient Tuberculosis of the Lungs in Young Adults. H. Assmann. Radiol., 14: 93-98, February, 1930.

In incipient tuberculosis of the lungs in young adults there are foci of infiltration which in certain cases can be recognized only by a roentgen examination, and, which are situated in the infraclavicular region, more rarely in the lower parts of the upper lobes. From these foci a general tuberculosis may develop. With timely treatment, however, a favorable prognosis may be given. Early diagnosis and immediate, energetic treatment in the early stages are the ends for which one should strive.

Radium in the Treatment of Diseases with Subcutaneous or Mucous Membrane Hemorrhages. J. M. Hoffman. Radiol., 14:136-138, February, 1930.

We may conclude from the foregoing cases that radium offers a new and valuable aid in the treatment of hemorrhagic diseases of the new-born, as well as in simple purpura hemorrhagica. In hemophilia, radium will offer help in controlling the severe hemorrhages without the aid of medication and may be the means of aiding the organism to eradicate the disease completely. Only after continued use of this method in these conditions will we be able to draw conclusions relative to the permanency of the cures as well as to the actual blood changes which result.

In conclusion, the authors add a word of warning. If the total erythrocyte count is below 1,000,000, this method must be used very cautiously, due to the hemolytic action of Gamma rays. Preliminary transfusion should be used to bring the blood volume above that level.

X-Ray Diagnosis and Therapy of Thyroid Disease. J. Remer and W. W. Belden. Radiol., 14:145-150, February, 1930.

In x-ray properly applied we have a sage therapeutic agent. Certain cases of toxic goitre should be given the benefit of radiation for at least four treatments. If satisfactory improvement is noted at the end of this time radium should be discontinued and the case regarded as surgical. If the improvement is satisfactory, radiation should be continued. Radiation does not increase the difficulty of subsequent operation. Radiation renders a patient a better surgical risk. The danger of hypothyroidism is negligible. The basal metabolism test is an important adjunct and the treatment of every case should be governed by it. Severe cases should be hospitalized and a period of rest obtained before a treatment is begun and following the first one or two exposures.

Diagnostic Pneumoperitoneum in Diaphragmatic Pathology. N. S. Zeitlin. Radiol., 14: 152-155, February, 1930.

Sub-phrenic pathology very frequently causes pleural effusion. This pleural effusion may obscure the position and mobility of the diaphragm and thus give rise to an erroneous diagnosis of simple pleural effusion. Pneumoperitoneum, using 200 c. c. of air is advocated as a safe method for the study of the diaphragm in questionable cases. Three typical cases are presented showing the advantages of this procedure.

Osteitis Fibrosis and Allied Diseases of Bone. L. H. Garland. Am. J. Roentgenol., 22: 517-530, Dec., 1929.

Osteitis fibrosa and osteitis deformans are histologically and anatomically identical. As Kaufmann says, "they are simply types of the same disturbance." Clinically and roentgenologically they manifest themselves in many diverse, and often curious ways, though both most often affect the long bones and the skull. With the increasing use of the roentgen ray in examination it seems probable that more and more borderline cases will be found, cases which can merely be said to belong to the osteitis fibrosa type of dystrophy, but are neither clear cases of osteitis fibrosa cystica nor osteitis de-

formans. Both types show spontaneous remissions, but on the whole the former, in its localized types, is as subject to cure (either surgical or by roentgen ray) as the latter is resistant to any form of therapy. Whether certain diets (high in calcium and vitamins A and D) will prove remedial is still uncertain.

Light and Heat Therapy in Gynecology. W. Flaskamp. *Am. J. Phys. Therap.*, 6:443-450, January, 1930.

The author hopes that his claims that surgical operation is no longer the method of choice in inflammatory diseases met with in gynecology, have been sustained by the detailed statement of indications and contra-indications he has mentioned in this article. Light and heat therapy are the most important factors in the conservative therapy of such cases. Results can only be obtained when the treatment is applied for a sufficiently long time and is given under the supervision of a specialist. Systemic as well as local treatment must be given.

Local Diathermy. M. H. Friedman, et al. *J. A.M.A.*, 92:1648-1653, May 8, 1929.

With their methods the authors have been unable to show any effect of diathermy on the rate of absorption of subcutaneously injected epinephrine or on the rate of absorption of subcutaneously injected phenolphthalein, unless edema was produced. In that case there appeared to be a distinct retardation in the rate of absorption.

Nor were they able to demonstrate any effect of diathermy on the rate of absorption of intramuscularly injected bismuth salts or on the rate of urine secretion.

Suggestive Findings Revealed at Autopsy in Patients Treated by Radiation. A. A. Thiabaudau. *J. Cancer Res.*, 13:66-72.

Radiation therapy cannot be said to have any casual relation in the production of pulmonary embolus. Hydronephrosis is a very common complication of malignancies in the pelvis. It occurs in both radiated and non-radiated cases. A statistical resume is made on three hundred autopsies in cases of malignancies.

Carbon Arc Versus Quartz Lamp in Dermatologic Therapeutics. M. Scholtz. *Calif. & West. Med.*, 31:183-186, Sept., 1929.

Carbon arc emits ultraviolet rays of actinic potency, less intense than quartz lamp, yet fully sufficient for the dermatologic therapeutic purposes. Carbon arc and quartz lamp cover practically the same field of clinical indications and, with a very few exceptions, can be substituted one for the other. Carbon arc is to be preferred in dermatoses with a systemic background. Carbon arc presents several practical and technical advantages over quartz lamp. Carbon arc is a therapeutic agency of equal value with quartz lamp, and is undeservedly neglected and ignored by dermatologists.

Urethral Caruncle. E. R. Loucks. *Radiol. Rev.*, 51:398-399, Sept., 1929.

The pathology, predisposing causes and treatment of urethral caruncle are briefly dealt with. Two cases are reported. The tendency to recurrence following surgery or any other form of therapy is emphasized. A proved technic, using a special radium applicator, is described. This technic provides a safe, certain, and convenient method of permanently curing a very troublesome, obstinate and by no means infrequently occurring condition.

Thoughts on Heliotherapy and Its Use in Pulmonary Tuberculosis. J. R. Earp. *Colo. Med.*, 26:245-249, July, 1929.

The recent literature on heliotherapy in pulmonary tuberculosis is reviewed as to indications and results. Some encouragement is derived from this review and a desire to know more of the rationale of this therapy. Biochemistry has not yet provided a scientific basis. Further clinical research is called for and a plea is entered for more accurate measurement of the doses that are being administered.

Variation in Radiosensitivity of Epidermoid Carcinoma of the Cervix Uteri. W. P. Healy. *Radiol.*, 13:323-325, Oct., 1929.

It would seem after reading this article, that a study of the histologic structure of epidermoid carcinoma of the cervix, combined with the knowledge of the radiosensitivity of the cellular structure concerned, offers a sound and satisfactory explanation for the favorable results of radiation therapy obtained in this field.

Factors in Dosage Determination in Interstitial Radiation. H. E. Martin. *Radiol.*, 13:338-352, Oct., 1929.

The determining factor in successful radiation therapy is the production of a lethal tissue dose in all parts of a neoplastic volume of tissue.

The dosage of interstitial radiation is empirical and depends on the proper evaluation of numerous factors always present in different combinations in a given dose. These factors are enumerated and discussed separately.

Intestinal Tuberculosis. B. J. McGinnis. *J. Mo. St. Med. Assn.*, 26:327-330, July, 1929.

Since intestinal tuberculosis is the most common complication of pulmonary tuberculosis, routine roentgenographic examinations should be made on all advanced pulmonary cases who are not showing proper improvement.

In a person known to have active tuberculosis the presence of filling defects in the cecum and ascending colon which remain in seven, eight and nine hour plates, together with general hyperfunction and absence of haustrations constitute evidence sufficient for diagnosis for tuberculous, ulcerated colitis.

Prolapse of Pedunculated Tumors and Gastric Mucosa Through Pylorus Into Duodenum. E. P. Pendergrass. J.A.M.A., 94:317-321, Febr. 1, 1930.

In prolapsing mucosa and pedunculated tumors the lesions tend to ulcerate, bleed and cause severe secondary anemia. The tumors frequently undergo malignant degeneration.

The important diagnostic procedure is the roentgen examination of the gastro-intestinal tract, which reveals the characteristic appearance of this condition.

In every case of unexplained anemia, a careful roentgen study of the gastro-intestinal tract should be made.

Diathermy as an Adjunct in the Treatment of Pelvic Inflammatory Disease. L. C. Scheffey and W. H. Schmidt. Amer. Jour. of Obst. & Gynec., 18:230, 1929.

Diathermy in pelvic inflammatory disease is compared with the routine expectant treatment by the authors, one of whom is a gynecologist and the other a physiotherapist. The rather small series of cases, offered for analysis of the study, is conducted in three groups:

1. Diathermy abdomino-vaginally,
2. Diathermy abdomino-sacral, and
3. Expectant treatment.

The conclusions show that less technical difficulties are encountered in operative cases when preceded by diathermy. Improvement and cures were about the same, whether diathermy was used or not and the length of hospitalization favored those not treated with diathermy. The small series show that curative and improved cases, with or without diathermy, were about the same, and the hospital stays even favored those in the latter group. Pain was not particularly relieved with diathermic treatment. The authors believe that heat is not the essential therapeutic factor but rather the helpful influence of improved vascularity that follows the diathermy. On the whole the authors conclude "after unprejudiced study of the limited number of cases during the past year, is that diathermy is a helpful adjunct in the treatment of pelvic inflammatory disease, in properly selected cases."

Treatment of Endocervicitis With Actual Caution and Electrocoagulation. Walter J. Harriman. Amer. J. Obst. & Gynec., 18:250, 1929.

Harriman has treated 200 cases of endocervicitis by cauterization and prefers electrocoagulation to actual cautery. The treatment varies with the degree of cervical involvement; in the milder cases by linear coagulations the canal is "striped" or coagulated in four or five sections. In the more involved cervixes the electrode remains in contact with any certain area of the cervical canal for a longer period of time, and the electrode drawn more slowly from the internal to the external os, just fast enough to prevent arcing or spark-

ing of the current. The erosion on the vaginal surface is treated in the same way until the entire area has become white—a proof of its coagulation. The diathermy machine is previously adjusted by plunging the active electrode into a square inch piece of veal or liver resting on an indifferent electrode. The lowest milliamperage is read, and is the standard employed for the cauterization of cervixes. Coagulation of the tissue at the point of contact occurs in one second.

The Outcome of 625 Pregnancies in Women Subjected to Pelvic Radium or Roentgen Irradiation. Douglas P. Murphy. Amer. J. Obst. & Gynec., 18:179, 1929.

The analysis of this study was based on answers to questionnaires received from all parts of the country. Only therapeutic irradiation was considered. The most striking findings in this study is the high frequency of gross deformities amongst babies irradiated in utero. The central nervous system is most often affected. The frequency and uniformity of the defects observed (microcephaly most frequent) leaves no doubt that irradiation of the internal genitalia of pregnant women is likely to be followed by seriously defective offspring.

The Action of Roentgen Rays Upon Eder's Solution. R. W. G. Wyckoff & L. E. Baker. Am. J. Roentgenol., 22:551-554, Dec., 1929.

Determination of the amount of HgCl precipitated from a mixture of HgCl₂ and (NH₄)₂C₂O₄ by roentgen irradiation offers a simple and accurate chemical means of estimating the amount of this irradiation. An analytical procedure which gives an accurate determination of HgCl in such solutions is described and typical curves are reproduced showing the relation between the weight of precipitated HgCl and the amount of the incident roentgen irradiation.

This reaction has provided a convenient dosage meter for certain studies of the chemical effects of soft roentgen rays where it was impossible to employ outputs of strictly constant roentgen ray output.

Calcification of Intrathoracic Exudation. C. C. Anderson. Am. J. Roentgenol., 22:531-535, Dec., 1929.

From a consideration of the material available it appears that pathological deposits of lime salts within the thorax are preceded by retrogressive changes in the tissues affected and that in the non-tuberculous forms there is nearly always an antecedent history of sepsis.

The premise advanced by Cutler and Sosman that calcification must occur in a large percentage of cases of adherent pericardium appears to be well supported by the evidence that they adduce, in which case the roentgenologist should be able to provide the clinician with considerable aid in the diagnosis of adherent pericardium.

Three cases of extensive non-tuberculous intrathoracic calcification are reported, one being the nine-

teenth recorded case of pericarditis calcuosa diagnosed during life.

Suggestions for roentgenological technic are: increased penetration, short exposure and where possible the use of a secondary diaphragm.

The Comparative Value of Irradiated Ergosterol and Cod Liver Oil as a Prophylactic Antirachitic Agent When Given in Equivalent Dosage According to Rat Units of Vitamin D. D. J. Barnes, et al. Am. J. Dis. Child., 39:45-58, January, 1930.

Cod liver oil prevented or cured rickets in 95 per cent of the cases studied when given in a dosage of 3 teaspoonfuls daily (1,400 rat units of vitamin D). Considering the subjects who were normal or improved at the end of the experiment, 98 per cent were either well or benefited.

A mixture of cod liver oil plus irradiated ergosterol in a dosage of 3 teaspoonfuls (3,750 rat units of vitamin D daily) prevented or cured rickets in 98 per cent of the cases.

There was no evidence of superiority among this group as compared with the group given cod liver oil.

Irradiated ergosterol in a daily dosage of 1,250 rat units of vitamin D prevented or cured rickets in only 44 per cent of the cases studied. The results in this group were not significantly better than those for the control group of untreated subjects.

Cod liver oil in a dosage of 1,400 rat units of vitamin D per day was a much more satisfactory antirachitic agent than was the irradiated ergosterol in the approximately equivalent rat unit dosage. It would seem that we are not justified in considering rat units of vitamin D in irradiated ergosterol as being equivalent to the same number of rat units of vitamin D in cod liver oil as a curative or prophylactic remedy for rickets.

There is no definite evidence of a greater incidence of rickets among formula-fed than among the breast-fed infants.

There is evidence of a greater need for protection against rickets among the colored infants, as is shown by the greater final incidence of rickets among these infants in the control series and in the group given irradiated ergosterol. It is also clear that these infants are protected successfully by a daily dose of 3 teaspoonfuls of cod liver oil (1,400 rat units).

The Production of Ultraviolet Erythema. M. G. Smith. Am. J. Phys. Therap., 6:462-465, January, 1929.

Ultraviolet erythema is a product of ultraviolet wavelength beginning at 3022 μ and shorter. This region coincides with the fraction of ultraviolet spectre known to be of therapeutic benefit and it therefore suggests that there may be a relation in the physiological effect of ultraviolet radiation and the ability to produce an erythema. It is to be observed that this desirable therapeutic region is the least able to penetrate, mak-

ing it extremely difficult to assume that the elective action of ultraviolet can be primarily upon the blood.

The Calibration of Bucky Grenz-Ray Tubes for Therapy. L. E. Jacobson. Am. J. Roentgenol., 22:544-550, December, 1929.

Each tube must be calibrated on that apparatus on which it is used in therapy.

For a complete calibration for practical purposes, the following characteristics of the tube must be known:

(a) The quality of the grenz rays should be defined by the half-absorption value in aluminum.

(b) The intensity in r-units per minute for each kilovoltage and each distance must be known. These data can be recorded on a curve in which distance is plotted against r-units per minute for each kilovoltage. It is useful to prepare a table for each kilovoltage in which the time is indicated for a definite number of r-units.

(c) The field should be mapped either in r-units per minute or more easily photographically.

For practical purposes the grenz-ray chamber can be placed within the range of 3 to 10 cm. from the window of the tube in order to define the half-absorption value, provided the half-absorption value is about 0.04 mm. aluminum or less.

By the addition of the correct thickness of aluminum the quality can be changed, that is, the half-absorption value can be increased to the desired amount.

Grenz rays become hardened as the distance from the tube increases as shown by the increase in the half-absorption value at 20 cm. air distance over that at about 4 cm. air distance. The higher the voltage the greater the hardening.

The same tube on two different apparatus may have different intensities even for the same quality ray.

Two tubes of the same construction, each being used on the same apparatus under the same conditions of voltage and amperage, may have quite different characteristics of quality and intensity.

Curves are given which show the half-absorption value for different voltages, different tubes and different distances.

Curves are given for a number of grenz-ray tubes which show the variation in intensity, r-units per minute, with distance for different voltages.

Diagrams of the fields of grenz-ray tubes are shown.

Radiology in General Practice. I. J. Murphy. Radiol., 51:1-2, Jan., 1930.

With modern equipment, properly installed, there is no danger to the patient from any correctly applied routine diagnostic procedure; at times caution is required when retaking dental films and for the sinus exposures. Whether fully protected by insurance or not, no practitioner willingly causes a patient a worry or an inconvenience. Fortunately many pending suits are dropped because the superficial erythema faded and everything appeared normal by the time the trial was called. The prudent man realizes that there is greater

danger, especially to himself, in the prolonged fluoroscopic examination than there is in the average treatment for superficial skin lesions. Those practitioners who do not wish to buy the x-ray therapy clause are turning to radium under proper supervision for such patients as can be treated at home.

Radiation Therapy in Malignant Disease—Results to be Expected. G. E. Pfahler. Radiol. Rev., 52:3-8, Jan., 1930.

Cancer of the skin can be cured by electrocoagulation and radiation in practically 100 per cent, if treated early.

Cancer of the mouth should be cured in from 50 to 75 per cent of cases in the early stage.

In cancer of the breast 45 to 75 per cent should be cured with operation combined with radiation, if treated early, depending upon the extent of the disease.

Cancer of the uterus should be cured by radiation in from 45 to 75 per cent if treated thoroughly and skillfully in the earliest stages.

Cancer anywhere in the body can generally be retarded by radiation, but in visceral carcinoma, operation should not be delayed for radiation, but on the other hand all operations for cancer should be followed by radiation, either with radium or x-rays, depending upon the condition.

Irradiation Therapy in Thyrotoxicosis. E. V. Powell. Radiol. Rev., 52:21-25, Jan., 1930.

Thyrotoxicosis should be treated symptomatically since our knowledge of its etiology is indefinite. All fecal infections should be eradicated. Rest is most important. Efforts should be directed toward reducing the vascularity of, or destroying the cells in the thyroid, which produce the altered or excessive secretion chiefly responsible for the symptoms. This may be accomplished by surgery or radiation.

Radiation produces an obliterative endarteritis of the arterioles and diminishes the caliber of the larger vessels. Hence, properly used, it should cure the pathologic condition present without sacrificing the required amount of glandular elements. It can be used in inoperable cases, in cases in which operation has not been successful, as well as in cases suitable for surgery.

Neither surgery nor radiation is 100 per cent effective. Surgeons have operated in cases that have been subjected to irradiation treatment, and radiologists have successfully treated unsuccessful operative cases. So, what should be the attitude of the physician in referring a case of hyperthyroidism? If he decides for operation he takes less chance if he refers the case to a surgeon trained and competent to handle such cases. If he decides for irradiation he should be equally careful to secure the services of a competent radiologist. It is essential to keep two things in mind; first, there is no mortality with irradiation treatment; and second, the end results are practically the same with either method.

A Roentgenologic Consideration of Duodenitis. B. R. Kirklin. Radiol. Rev., 52:9-14, Jan., 1930.

In 1921 Judd directed attention to duodenitis, inflammation of the duodenal mucosa with or without actual ulceration. His observations have been corroborated from the histopathologic standpoint by McCarty, Konjetzny, and Wellbrock. The present study of its roentgenologic manifestations is based on forty-five consecutive cases, without ulceration, observed in recent months in the Mayo Clinic. This series indicates that duodenitis is characterized roentgenologically by marked irritability of the bulb which tends to empty itself quickly but incompletely. As a rule, the bulb is small and grossly deformed by deep indentations, and its borders are less sharply defined than in cases of true ulcer. It differs also from typical ulcer in that a marginal niche or central fleck cannot be seen and does not cause gastric retention.

X-Ray Therapy. T. Harrold. J. Med. Assn. of Ga., 19:13-16, Jan., 1930.

The general field of x-ray is reviewed.

In certain benign conditions x-ray therapy is of permanent curative value and of great palliative value.

Radiosensitive malignant tumors are greatly benefited temporarily, but permanent cures are almost never accomplished.

Destruction of ulcerating malignant lesions by heavy caustic unfiltered x-ray radiation is recommended.

Diagnosis and Results in Carcinoma of the Stomach. A. E. Olson. Radiol. Rev., 51: 527-529, Dec., 1929.

The above review indicates:

Early diagnosis and radical surgery are necessary, to improve the results in treatment of carcinoma of the stomach.

There are no positive symptoms of this disease, but certain symptoms demand further careful investigation.

All forms of clinical and laboratory study should be made so that added suggestive signs may be detected.

Radiology offers the best means for accurate diagnosis and should be more freely utilized.

Roentgenologic Studies of Mastoid in Infants. C. L. Martin. Am. J. Roentgenol., 22:431-439, Nov., 1929.

After the age of six months a cavity having the shape of the mastoid can be demonstrated below the tegmen tympani and behind the external auditory meatus in good roentgenograms.

This cavity varies markedly in size and may measure three-quarters of an inch in diameter and show definite cell structure by nine months, though such excessive development is unusual.

Diploetic mastoids are probably diploetic from the start, whereas cellular mastoids begin as large single

cavities which slowly increase in size and usually begin to show cellular structure at nine to sixteen months.

The presence of pathological conditions of the mastoid can usually be detected in good roentgenograms after the age of six months, though double infections often make interpretation difficult.

Effect of Roentgen Rays on the Reticulo-Endothelial System. E. A. Pohle. Am. J. Roentgenol., 22:439-447, Nov., 1929.

The function of the reticulo-endothelial system has been studied by recording the elimination of Congo-red and trypan-blue injections in the ear veins of rabbits after exposure to roentgen rays. The limitations of this method are discussed.

The presence of considerable individual variation in the animals renders a precise interpretation of the results difficult. The role played by the part exposed, by the dose and by the time interval between irradiation and injection is too complicated to be expressed in a simple formula. Our findings are at variance with those reported by previous investigators.

A toxic reaction following injection of trypan-blue in rabbits if preceded by irradiation is described. As far as we could ascertain, this phenomenon has not been reported before.

In view of the fact that the reticulo-endothelial system extends throughout the whole organism and as we know so little about the factors controlling its function, any attempt at an explanation of the observed reaction leads to speculation. No theory is offered, therefore, to explain the results of our experiments but they are simply presented as the basis for further research.

Cascade or Waterfall Stomach. B. M. Golob. Am. J. Roentgenol., 22:451-455, Nov., '29.

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Three cases of cascade stomach are reported, two of which were of malignant and one of benign origin.

The etiology of cascade stomach is varied and the underlying cause in individual cases must always be sought.

Some cases of cascade stomach have great pathologic significance; others probably represent anomalies. It is of great importance to make the distinction.

Cascade stomach due to traction or pressure of the distended colon (riding cascade stomach) is as a rule easily recognized.

In hour-glass stomach the two sacs lie vertically one above the other. This is not the case in cascade stomach.

The identification of the form of cascade stomach is made by roentgenologic examination with the opaque meal. The determination of its underlying cause requires a comprehensive clinical investigation.

Tumors of the Salivary Glands. C. P. Wakeley. Surg. Gynec. & Obstet., 48:635-638, May, 1929.

Wakeley describes one case of agiomatosis of the

salivary gland which came under his observation together with several others collected from the literature. He also gives a short description of the adenomata. The paper for the most part is devoted to a discussion of the mixed tumors of the salivary glands, most common in the parotid. These tumors show a definite tendency to recur even after a long interval and are therefore considered by many surgeons to be potentially malignant. He quotes Burrow who considers that the most satisfactory method of treatment is operation combined with radium irradiation. He, himself, advises great caution in the employment of radium treatment and believes that only small doses should be employed at operation. The radium tubes should be left in the cavity after removal of the tumor. He has seen two cases in which radium was used and complete paralysis of the facial nerve ensued. He reviews 52 cases of parotid tumor operated upon at King's College Hospital, and concludes that treatment by radium or deep roentgen therapy does not seem to lengthen life to any appreciable extent. Whatever the pathogenesis of the mixed tumors of the salivary glands may be, it is certain that recurrence after operation is common, and therefore these tumors should be considered as potentially malignant.—R. S. Bromer.

On the Generalized Effect of Radiations in Myelogenous Leukemia. M. M. Strumia. Am. J. M. Sc., 48:676-681, May, 1929.

The purpose of this paper is to present definite evidence in support of a conclusion reached by the author in a previous communication; "the mechanism of the action of radium upon the leukemic foci is of a generalized as well as a localized nature." In other words, when radium is applied to any portion of the body, its effect is carried by the blood stream to the leukopoietic foci. Thus from a local application, a generalized action is obtained.

Two cases are reported. The first, a young white woman, with an early untreated myelogenous leukemia received two autotransfusions of irradiated blood. After each one of the transfusions blood changes occurred, in all respects similar to those obtained where radiations are applied to the body (long bones). A marked diminution in the size of the spleen was also obtained.

The second case was that of an adult negro with advanced myelogenous leukemia, who was given two radium treatments on consecutive days, the emanation tubes being applied over the lower thirds of both tibiae and the short bones of both feet. That the application had effect was evidenced by the sudden rise in the number of leukocytes, followed by a sharp drop, and by the conspicuous changes in the differential blood count. At autopsy, it was found that there was no hyperplastic bone marrow in either tibia, nor in the short bones of the feet, but only fatty aplastic bone marrow; also that there was no difference whatever between the bone marrow of the bones which had been irradiated, and of some that had not been irradiated. This was especially evident, comparing smears and sections of the lower

third of the tibia irradiated, and the upper third of the tibia which had not been irradiated.

In the first case it is obvious that the irradiations as such or their effects were carried by the irradiated whole blood. In the second, it would be very difficult to trace a direct effect of the radium applications upon the bone marrow of the bones irradiated. The effect of radium emanations upon the hemoplastic foci must be explained on the ground that the radium emanations as such are carried by the blood or that they act through the production of leukotoxins, which are produced by the direct effect of the radium emanations upon the white cells of the reticulo-endothelial system. In fact, in the second case there was no active bone marrow in the bones irradiated, and there was no difference between the portions irradiated, and those not irradiated.

Radium and roentgen rays affect the hemopoietic centers by an indirect generalized action rather than by a direct local effect. It is not yet clear whether this indirect effect is produced by the blood transfer of emanations to the bone marrow, or by the extramedullary productions of leukotoxins, which are then transported to the bone marrow. In the treatment of myelogenous leukemia by radium or roentgen rays it is the dosage rather than the place of application that is important. —R. S. Bromer.

The Sympathicus in Relation to Physical Therapy. B. B. Grover. Med. Herald and Physiotherapist, 48:319-327, Nov., '29.

An understanding of the sympathetic nerve system is paramount to the scientific application of physical therapeutic agencies. In so far as life is concerned, the sympathicus is the dominant structure of the human body. It presides over secretion, absorption, nutrition, peristalsis, gestation, respiration, circulation of the blood, sensation and subconscious phenomena. The ganglia of the nerve cells receive, reorganize and emit nerve forces.

Normal heart action is dependent upon physiological equalization of the sympathetic vagus nerves. Stimulation of the vagus shows the pulse rate. Inhibition of the sympathetic slows the pulse rate. These activities are temporarily under our control through proper application of physical agencies, and by repeated application may yield surprising results.

The reduction of blood pressure by high frequency currents largely depends upon sedation of the sympathicus. Heat in large quantities is a therapeutic waste, that the different tissues of the body are capable of appropriating only a certain amount of heat, hence, heat in large quantities may overcome selective absorption and prove ineffective as a therapeutic agent. We seem to be on the threshold of a change in our knowledge of the chemical and consequent physiological effects of heat on cellular structures of the body. Chemical changes are in the arc in direct proportion to the amount of heat absorbed and not to the quantity administered.

The ability of extremely fine constructed neuron and synaps to transmit electric currents is limited, and the function of these structures may be overcome by strong currents and the therapeutic object be thwarted. The beneficial effects of diathermy in pneumonia are due primarily to its sedative action upon the sympathicus. High frequency currents influence chemical changes in the cell, not only by reason of the ionic changes but the influence exerted upon internal secretions through nerve stimulation and sedation. They also influence the chemical composition as well as the physical and electrical state of the cell.

Mechanical Vibration in the Treatment of Cardiovascular Diseases. J. P. Armstrong, F. S. Meade, B. B. Grover, A. E. Snow and Mary A. Snow. Med. Herald and Physiotherapist, 48:298-301, Oct., 1929.

Mechanical vibration is a valuable supplementary measure in the treatment of selected cardiovascular condition including uncomplicated hypertension, hypotension, splanchnic dilatation, cardiac asthma, tachycardia, and aortic dilatation. Special attention is called to the use of vibration over the liver for the reduction of blood pressure. Spinal vibration with the ball vibrated preferably the hard rubber, not the vulcanite, ball is used at special sites for definite reflex effects.

A slow rate of speed is to be preferred to induce reflex activity and time is an important factor to be recognized.

Annular Shadows and Intrapulmonary Shadows. G. H. Faget. Southwest. Med., 13: 298-302, July, 1929.

In a study of 57 autopsies 103 cavities were found; 93 per cent of these showed in the x-ray films and 59 per cent were found by the physical examinations.

There was an error of 9 per cent on the positive side in the physical diagnosis as six cases diagnosed cavities proved to be fibrosis and lung atelectasis in 5 and a deviation of the trachea to one apex in the other.

In only one case did an annular shadow prove not to be a large emphysematous bleb, making the error on the positive side for the x-ray interpretation practically nil. Roentgenograms are reliable in the diagnosis of cavitation, whereas physical signs are notoriously uncertain. Annular shadows, in an overwhelming majority of cases, are due to intrapulmonary cavities.

Heliotherapy in the Treatment of Extrapulmonary Tuberculosis. F. C. Goodwin. Southwest. Med. 13:485-488, Nov., 1929.

While heliotherapy at an altitude is one of the major factors in the cure of extrapulmonary tuberculosis, it must be carried on in connection with rest, fresh air, nourishing food, proper mechanical appliances, and surgery when indicated.

The Value of X-ray and Radium in the Treatment of Breast Carcinoma. J. W. Cathcart. Southwest. Med. 13:224-227, May, 1929.

Radiation has a definite place in the treatment of breast carcinomas. Preoperative radiation of operable breast malignancies will, we believe, give the largest number of five-year cures. Postoperative radiation should be administered for at least two cycles—one about two or three weeks after operation; the other, after a lapse of four weeks. If the malignancy had extended beyond the breast at time of operation, then at least four series of treatments should be given. Cases of inoperable recurrent breast carcinoma may have suffering decreased and lives prolonged by radiation. A reasonably accurate prognosis can be made in each case by use of the Lee clinical index.

X-ray Examination of the Gastro-Intestinal tract. R. W. Fouts. Med. Herald and Physiotherapist, 48:169-171, June, 1929.

Proper preparation of the patient is of vital importance. Hurried or incomplete examination should not be attempted. Better do it right or leave it undone. Slipshod examination is unfair to the patient and in time causes the referring physician to lose respect for and doubt the value of the x-ray as a diagnostic aid in these cases.

Fluoroscopic examination is all important in gastro-intestinal examination and sufficient time should be allowed for proper accommodation of the eyes. A preliminary examination of the chest should be made. Opaque enemas are necessary for a complete study of the colon and should be routine. A discussion of the x-ray findings and their interpretation with the clinician will be of value to all concerned.

Report of Committee on Static Electricity. W. B. Snow. Med. Herald and Physiotherapist, 48:202-204, July, 1929.

The static modalities are of the constant current of high voltage and low amperage and possess qualities peculiar to the constant or direct currents, acting characteristically upon individual cells independent of the neuromuscular mechanism. In the therapeutics of inflammation the effects are peculiarly adapted to the removal of local stasis or infiltration by successive contractions induced independently of the cells, thus expressing from the lymph spaces accumulated exudations with restoration of circulation and repair.

Clinical Observations on Ultraviolet Radiation. E. L. Libbert. Med. Herald and Physiotherapist, 48:267-270, Sept., '29.

Ultraviolet of itself is not a true specific for any disease, but is a most decided adjunct in the treatment of many. Treatment should not be given more often than every alternate day, and in some instances, no oftener than twice a week. In eczema and the eczematoid dermatoses, treatment should be continued a time

after the initial lesion is healed. Calcium therapy is important in combination with ultraviolet radiation.

Present Status of Physical Therapy in Dental Practice. C. E. Norris. Med. Herald and Physiotherapist, 48:232-233, August, '29.

Physical therapy in dentistry is valuable when used as an adjunct to medicinal and mechanical measures. Its abuses are many and are not due so much to the inefficiency of the apparatus as to its inappropriate use. Correction of this requires a thorough study of the basic principles of the therapy, a determination of the results and the standardization of technic.

This can be best accomplished by the appointment of a council of Physical Therapy in the A. D. A. made up of men of previous experience and unquestioned ethics, necessary ability and authority to correct the physiotherapeutic chaos which is now existent.

Electrosurgery and Intravenous Somital Anesthesia. E. N. Kime. Med. Herald and Physiotherapist, 48:259-260, Sept., '29.

In endothermic or "cautery type" operations about the head, oral or nasal passages, and by following the safe-guards for dosage and antidote administration, intravenous somital seems to be a valuable anesthetic agent and for the following reasons:

(1) There is no danger of explosions. (2) Local anesthesia may be unnecessary, but if it is found necessary a greater quantity may be safely used. (3) The anethetist may become an assistant in maintaining exposure of the operative field as well as an airway for the patient. (4) Even in debilitated patients there is less after nausea and shock, and especially so if caffeine and ephedrine are prophylactically exhibited. (5) The combination of these two comparatively new therapeutic agencies, intravenous somital and electrosurgery, will probably revolutionize the management of otherwise hopelessly incurable septic neoplasms.

Intrinsic Defects of the Gastrointestinal Tract. D. Y. Keith. Am. J. Roentgenol., 22:455-460, Nov., 1929.

With close cooperation of the clinician, the surgeon and the roentgenologist, the location and frequently the origin of many obscure lesions of the abdominal cavity may be determined.

A roentgen examination should be made on every rare, as well as every chronic, abdominal case in which a positive diagnosis cannot be determined with the usual careful physical examination. A careful history and physical examination of the abdomen by the roentgenologist prior to the roentgen examination may prove of invaluable assistance.

A careful study of films made in anteroposterior, posteroanterior, lateral and lateral-oblique positions, may give information as a group, where a single film presents only suggestive shadows.

In selected cases pneumoperitoneum may be of additional aid in arriving at a diagnosis.